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ABSTRACT

This paper, part of a long term study, reports the effect of a modified Montessori preschool experience on cognitive development, school-related behaviors, and social interactions and perceptions of disadvantaged children. Each of thirty-five disadvantaged Negro children (31 in nursery classes and 4 in elementary classes) was pair-matched with a middle class child. In the disadvantaged group, 17 children were attending nursery classes for the first time. Pre- and posttests were made of cognitive ability, on the Stanford-Binet, Piaget tests of length conservation, and sociometric features. Also, children were rated by testers on performance and by teachers rated classroom behaviors. Data from previous years on some of the children were used in reference to long term change. Part I (nursery school) test results show that neither first nor second-year children significantly increased their I.Q. scores. Both disadvantaged and middle class children scored similarly on task orientation. Middle class children showed more friendship choices forming across social-class lines. Part II (elementary school) results present limited support for the theory that children who continue in Montessori, rather than public, school will show better school achievement. Data included school records of more than 30 children. A future study will investigate diffusion effects on mothers and younger siblings, and testing with measures more directly relevant to Montessori curriculum. (NH)

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FINAL REPORT: OEO GRANT CG-8469 A/2

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Title of Project: Ancona Montessori Research Project for Culturally Disadvantaged Children

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INTRODUCTION

Since 1965 the Ancona Montessori School has had OEO support to investigate the effects of a modified Montessori program for disadvantaged children in the preschool and early elementary years. This report deals with the academic year 1968-69. During this year thirty-five disadvantated children and a comparison group of thirty-five middle-class children have been the central focus of study as they are currently attending the school. In addition, we have continued to follow the school careers of disadvantaged children who attended Ancona at one time or another since 1965 and are now attending school elsewhere.

Most of the children who attended Ancona this year are in the age range from three to six years and participated in the nursery classes at the school. However, four of the thirty-five children in the current sample were children who had completed the Ancona nursery program previously and were attending the elementary school classes. For ease of presentation, this report will be divided so that the first part will deal with the findings relative to the nursery school children. Part II will detail findings on the elementary school children and follow-up data on children who attended Ancona in previous years but are now elementary school children in other institutions. In addition, data regarding children whose families have had long-term involvement in the school will be discussed in Part II.

The Ancona Montessori School is a parent-governed nursery and primary school. The school serves a population of children who are predominantly of middle-class background but the racial composition of the school is quite balanced including both Negro and white children. The disadvantaged children attending the school are all Negro and most come from the neighborhood immediately adjacent to the school. It has always been the policy of the school to place the disadvantaged children in its regular classrooms with a small number of these children in each classroom. In this fashion the diversity of most classrooms has been enhanced.

The overall objectives of the program as originally stated in our OEO proposal are focused in four areas:

(1) Enhancement of the children's intellectual growth through exposure to the structure, materials and methods of a modified Montessori classroom. The modified Montessori classrooms provide (a) opportunity for the development of attention and independent task interest through their stress upon individual teaching and learning with self-chosen, self-correcting materials; (b) opportunity for the development of abstract concepts through the Montessori sensory materials which provide training in sensory discrimination, matching, and seriation, and through supplementary materials promoting the classification of real objects; and (c) opportunity for expressive and dramatic play.

(2) Providing continuity of educational intervention by early entrance into the school, and by enabling the children to remain in the school through the primary grades.

(3) Providing a school setting integrated by race and social class, in order to (a) expose the disadvantaged children to an atmosphere of greater task orientation and to the use of standard English speech; (b) provide both social groups with the opportunity for contact through common endeavors; and (c) provide the opportunity for interaction among the parents of the middle-class and disadvantaged children through the extensive parent participation which is part of the Ancona School's program.

(4) Continued involvement with the families of the disadvantaged children, through (a) recruitment of younger siblings into the program; (b) a social work program aimed especially at the promotion of self-help through more effective problem-solving in the families; and (c) provision of medical services.

General Statement of Hypotheses To Be Investigated

The hypotheses studied in this research project deal generally with the effects of attendance at the Montessori school on the intellectual development of disadvantaged children, the effects on a cluster of school-facilitating behaviors such as attention and task orientation, and the effects on social interaction patterns and perceptions. In addition, particular interest has been paid to the progress of children from families who have participated in the school's program over a number of years.

More specifically, the hypotheses currently under study are as follows:

Hypothesis 1: A Montessori program will increase the basic cognitive and behavioral skills of disadvantaged children required for educational achievement. This effect will be greatest if started early (age three) and continued over an extensive period of time.

Hypothesis 1a: The disadvantaged children will show increased cognitive development.

Hypothesis 1b: The disadvantaged children will show increased attentiveness to task demands.

Hypothesis 1c: Disadvantaged children who continue in the Montessori elementary program will show higher school achievement than those who go to public school.

Hypothesis 2: Interaction between middle-class and disadvantaged children will increase over a year-long program, at the children's own pace, and facilitated by common interests and shared activities.

Hypothesis 2a: There will be an increase in cross-group social acts.

Hypothesis 2b: There will be an increase in cross-group cooperative play.

Hypothesis 2c: There will be an increase in cross-group friendship choices.

Hypothesis 3: Interaction with the middle-class children will result in increased linguistic skills in the disadvantaged children.

Hypothesis 4: Continuing involvement of the same families in the program will result in "diffusion effects" to the intellectual attainments of older and younger siblings.

Hypothesis 4a: Older siblings will continue to show school attainment above the norm.

Hypothesis 4b: Younger siblings entering the program will show higher initial cognitive and behavioral skills.

As hypothesis 1c is in regard to the elementary school children, it will be discussed in Part II of this report. To the extent that other hypotheses also deal with older children or Ancona graduates, discussion of them will also be deferred. In addition, Hypothesis 4 will be discussed in Part II.

The research rationale which led to the formulation of these hypotheses for study has been detailed in our original reports. Rather than repeat the rationale here, we will incorporate discussion of the relevant literature as we present the actual findings and discuss them.

PART I

THE STUDY OF THE NURSERY SCHOOL CHILDREN

The overall design of the study was a classic pre- and post-test paradigm. The disadvantaged children attending the nursery classes and a comparison group of middle-class children in the same classrooms were tested early in the academic year and close to the end of the year. As can be seen from the hypotheses, the primary interest was in ascertaining if change occurred on a number of characteristics of the children throughout the course of the academic year and as a result of the preschool experience. Since this is a long-term study, data from previous years on some of the children are available and will be used to speak to questions of long-term change.

The Sample

Thirty-one disadvantaged children participated in the classes of the Ancona preschool. These children were all Negro children coming from poor families who live in the neighborhood adjacent to the school. In general, the families of the children meet OEO guidelines for participation in Headstart programs; thus the families have poverty line incomes and many are mother-only households.

Seventeen of the disadvantaged children were in attendance at Ancona for the first time this year. A special effort was made to recruit children from families who had children in attendance at Ancona in previous years. Seven of the seventeen new children were younger siblings of children who were currently attending Ancona or who had participated in the Headstart program in previous years. The average age of the seventeen first-year children was forty-four months as of October, 1968. There were seven boys and ten girls in this group.

In addition to recruiting children from families who had participated previously, a special effort was made this year to locate "hard core" families. Recruiting for the 1967-68 year had been done by teachers and a preference for upwardly mobile families may have been operating. The families who had children attending Ancona during 1967-68 did meet OEO guidelines, but could be generally characterized as poor but upwardly striving families. Thus a number of the families were intact (six out of fifteen) and had either or both parent as an employed person. The mean entrance I.Q. of last year's group was 96.6. This is typical of Headstart populations in the city of Chicago generally (Shipman reports a mean of 94.5 for Negro Headstart children in the city of Chicago).

Since initial I.Q. and family characteristics of last year's sample placed them at the upper end of the poverty group, we felt it important to try to locate hard core families who might be even more in need of the stimulation of the preschool experience. The children admitted this year who were not younger siblings do seem on the basis of family characteristics to be a more disadvantaged group than the entrance group last year. The ten children who are not younger siblings come from the following variety of backgrounds: one child is from a father-present family, in which the father works as an unskilled laborer; eight children are from father-absent families, in which the family is receiving Aid to Dependent Children and in which the mother is typically a young woman of

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urban background; and one child, whose family is an ADC family, is being supported by Catholic Charities in a foster home.

The fourteen other disadvantaged children attending nursery classes had attended Ancona in previous years. Eleven children were in their second year of attendance, two were third year, and one was fourth year. This group had an average age of sixty-one months and was composed of seven boys and seven girls.

To the extent that it was possible, every disadvantaged child was pair-matched with a middle-class child in his own classroom. The criteria for matching were sex, age, and prior attendance history. The middle-class comparison sample was composed of sixteen first-year students and fifteen students in their second to fourth year in the school. The average age for the first-year group was forty-three months; for the second- to fourth-year group it was sixty months. There were sixteen boys and fifteen girls in the middle-class comparison group.

Instruments and Procedures

Most data gathering procedures were administered twice to all children in the disadvantaged and middle-class comparison groups. Testing was carried out during the beginning of the school year and close to the end of the school year. Test administration was done by four trained testers. Three of the testers are advanced graduate students in psychology and education; the fourth is a former teacher. The testers are all Caucasian women.

The procedures used can be classified as to the general type of variable being measured. One set of variables deals with the intellectual or cognitive development of the children. Another set of procedures is measuring certain school related behaviors thought to be facilitative of school success. Another set assesses social interaction and perception variables.

Measures of intellectual development

(1) The Stanford-Binet Intelligence Test, From L-M. On the average, children were administered the Stanford-Binet after six weeks of school attendance for the

first testing and after thirty-three weeks for the second testing. Thus there was approximately a twenty-seven-week interval between first and second testings. The earliest a child received the first test was three weeks after school started.

The Stanford-Binet was administered according to standard procedures by testers who were trained to the usual standards. In general, the test was given in one session of about one hour, but testing was terminated if the child was tired or uncooperative and was continued at another session.

(2) Piaget test of length conservation and Piaget test of transitivity of length. All children were given the test of length conservation. Only children who conserved were administered the transitivity test. These tests were administered during the twelfth week of school on the average for the first testing and after thirty-five weeks of school for the second testing.

The procedure follows the general approach set forth by Piaget for assessment of length conservation. The child is presented with two sticks which vary in length. An assessment is made to see if the child can retain his concept of which is longer when faced with a placement of the sticks which presents a perceptual situation contrary to a judgment of conservation.

The test of transitivity of length is only administered to children who can conserve length as conservation is seen as a prerequisite to the operation of transitivity. The procedure for assessing transitivity is also based on studies by Piaget. The test itself involves a number of presentations of sticks of varying length in an attempt to see if the child will spontaneously use the rule of transitivity to make judgments of relative length.

Measures of school-related behaviors and attitudes

(1) Modified Birch procedure for categorizing response styles to cognitive task demands on the Stanford-Binet test, developed by the University of Hawaii Headstart Evaluation and Research Center. At the time of administration of the Stanford-Binet Intelligence Test, a record was made of the children's responses to the items presented and of the tester's behavior in conjunction with the test administration.

Hertzig, Birch, et al. (1968) have developed a coding system whereby children's responses to the Stanford-Binet can be examined for such dimensions as work orientation, type of not-work responses made, etc. This procedure originally was used in a study of lower-class Puerto Rican children and a contrast group of middle-class children. Ethnic and social-class differences were found in styles of response and it was hypothesized that these differences in part explained the differential school success of the groups under study. The procedure results in a number of scores on which group comparisons can be made.

(2) Testers' ratings of attention, task behavior, attitudes toward testers' authority. Following each administration of the Stanford-Binet, the examiner rated the child on a number of dimensions of test behavior. Ratings were made following both the first and second administration of the tests. The dimensions pertain broadly to test behavior as such and to the social relationship the child exhibits with the examiner.

These test ratings have been made every year in conjunction with the Ancona Headstart research. Test ratings were made on fifteen scales. The scales are designed so that end points do not necessarily conform to optimal vs. detrimental test behavior. End points of the scales usually refer to extremes of behavior with optimal behaviors falling at the midpoints. Ratings include such dimensions as Distractibility, Activity Level, Speed of Response, Persistence, Self-Confidence, and Understandability of Speech. A copy of the rating form can be found in Appendix A.

(3) Teachers' ratings of attention, task behavior, attitudes toward classroom authority. Teachers were asked to rate the children in the research sample on a number of dimensions at the beginning and end of the school year. Teachers' ratings were made at approximately the same time that the Stanford-Binet was administered. The rating forms used by the teachers were parallel to those used by the testers. The child's behavior in the classroom, rather than in the test situation, was the object under consideration. Twelve of the fifteen dimensions rated by the testers were rated by the teachers.

Measures of social perceptions and social interaction

(1) Sociometric procedure. The sociometric questionnaire was designed to assess the extent to which children would choose others from their own social-class background or race and to assess the extent to which cross-group choices would occur. All children were administered the sociometric questionnaire individually. The first administration occurred after about twelve weeks of school, the second after thirty-six weeks.

The procedure involves showing the children photographs of all the children in their classroom and photographs of all the children in another classroom. The first part of the testing session was devoted to asking the child to name all the children in his classroom. If a child did not know a name, the examiner provided it. The most important part of the procedure followed. The child was asked to select three children he would like to play with from his own classroom. He was then asked to choose two children he would not like to play with from his own classroom. After the choices for his own classroom were made, the same procedure was followed in reference to the children in the other classroom. The two groups of pictures were used on the assumption that the children would know the children in their own classroom, whereas the choices in the other classroom might be more along stereotyped lines.

(2) Classroom observations of social interaction. A system for observing and coding the social acts of children toward one another has been in use at Ancona since 1965. The system is based on a set of categories described by Martin (1965) and allows for the coding of behavior into fifteen categories of aggressive, affiliative, cooperative, and withdrawing acts. In addition the child to whom the act is directed is also recorded.

Observations were collected in the middle of the school year during the months of February, March and April. A total of four observers collected the observational data after being trained to an adequate level of reliability by the research director who was one of the observers. Data were collected by using a time sampling procedure. Each child was observed during the free play period in his classroom for seven one-minute sessions on six separate days. Thus a total of forty-two minutes of behavior was observed for each child in the sample. These behavior samples were coded by dividing each minute into four fifteen-second intervals and coding the first social act which occurred in each fifteen-second interval. Thus a maximum of 168 social acts was coded for each sample child. In general, however, a social act did not occur in every interval which was observed.

Operational Statement of Hypotheses for the Study of Nursery School Children

Having described the sample and instruments, it is now possible to detail the procedures for testing the hypotheses of the study.

Hypothesis 1: A Montessori program will increase the basic cognitive and behavioral skills of disadvantaged children required for educational achievement. This effect will be greatest if started early (age three) and continued over an extensive period of time.

Hypothesis 1a: The disadvantaged children will show increased cognitive development.

Hypothesis 1b: The disadvantaged children will show increased attentiveness to task demands.

There are a number of analyses which should shed light on the validity of Hypothesis 1 and its subparts. In regard to long-term effects, it is possible to examine the performance of children who have been in the school more than one year to see if they improve intellectually in relation to their initial status. The data most relevant to this point are Stanford-Binet scores which are available at the beginning and end of successive years in school.

The effect of this year's participation on the cognitive development of the nursery school children will be examined by comparing mean performance on the Stanford-Binet at the beginning and end of the school year and by a similar analysis of the performance on the Piaget tests. Comparisons on these tests can be made for the group as a whole as well as for children who are in their first year of school and children who have had previous schooling.

Assessment of children's performance in regard to school facilitative behaviors comes from a number of sources. Test and teacher ratings of behavior will be examined for possible changes from the beginning to the end of the year. In addition, the modified Birch procedure will be included in this analysis.

Hypothesis 2: Interaction between middle-class and disadvantaged children will increase over a year-long program, at the children's own pace, and facilitated by common interests and shared activities.

This hypothesis can only be tested partially. Sociometric choices of the children were collected early in the school year and near year's end. Changes in the direction of own-group or out-group as targets of positive or negative choices can be assessed. However, the actual social interaction patterns of the children were only observed during the middle of the school year. We can characterize the nature of the social acts which the children made at that time, but it is not possible to talk about change in the nature of such acts.

Hypothesis 3: Interaction with the middle-class children will result in increased linguistic skills in the disadvantaged children.

Since we did not make a direct assessment of child language, hypothesis 3 is being tested with a number of indicative measures. Changes in teacher and tester ratings on the Verbalization scale will be relevant to this point. In addition, certain items in the Binet can be viewed as primarily verbal in character and will be examined in this connection. Preference for verbal response in (1) work responses, (2) non-work responses and (3) extensions of work responses as measured by the Birch procedure will also be examined.

Results and Discussion

Stanford-Binet data

The first set of data relevant to hypothesis 1 is the Stanford-Binet scores of the nursery school children. To examine long-term effects it is possible to look at those children who have been in the school more than one year. Of the fourteen children who fall in this category, three have been at Ancona for more than two years. Since this is such a small number no statistical treatment of their scores was performed. Eleven children have completed two years at Ancona and received a total of five Binet testings during this period. Table 1 shows the means and standard deviations for the Stanford-Binet scores of these children. As can be seen from Table 1, the mean performance on the Stanford-Binet shows substantially no change over the two-year period of school attendance. An analysis of variance on these data shows the F-ratio to be non-significant.

Table 1

Mean Stanford-Binet Scores at Five Time Points for Children with Two Years of Attendance at Ancona (N = 11)

Time of Test	Sept. 1967	Dec. 1967	June 1968	Sept. 1968	June 1969
Mean	96.09	96.00	97.27	93.00	93.73
Standard Dev.	12.36	12.00	12.98	12.86	10.36

What should one conclude from these data? Most directly, if one assumes the Stanford-Binet is a representative measure of cognitive development, these children do not improve as a result of the preschool experience.

There are a number of possible explanations of these findings. In general, preschool experience results in an initial increase in intelligence test scores of disadvantaged children, followed by a decrease to the initial level or even a decline below it (see Hodges and Spicker, 1968; Weikart, 1967). Our data are generally consistent with the findings from other studies in regard to longer range effects on intelligence test performance. However, the lack of an initial increase needs explanation. As indicated in the description of the sample, the group which has been in attendance at Ancona since 1967 can be characterized as an upwardly mobile group. The entrance I.Q. indicates that these children probably received considerable stimulation at home. In summarizing data from numerous preschool projects, Bereiter (1966) notes that one typically expects an I.Q. increase equal to about half the distance between the initial I.Q. and 100. In other words, I.Q. increases occur primarily for children with scores considerably below 100 at school entrance. This group had an entrance I.Q. of 96. On the basis of Bereiter's formulation one would not expect any significant change in performance for this group and none was found.

Another possible reason for the lack of intelligence test score change for the 1967-68 group is difference in program in the school from year to year.

Although this is a viable alternative hypothesis, the children in this group were dispersed in a number of classrooms and to our knowledge no major school-wide changes in curriculum were instituted during this period. We would therefore rule out this alternative.

It might be argued that the ultimate objective of preschool intervention is not to raise intelligence test scores per se but to lead to school success for the children involved. It is too early to know how these children will fare academically, but it can be assumed that the preschool experience may well prepare them for later academic achievement more adequately than their home environments. Our follow-up study, presented in Part II, would seem to support this contention.

We feel it proper to conclude that for this group the preschool experience does not lead to an increase in intelligence test performance. Whether this means that these children will perform more or less adequately academically in the future remains an open question. On the basis of the follow-up data which are currently available to us, it would seem that their best chances for success would occur if they continue at Ancona for the elementary school years.

Having examined the data for the children who have participated in the preschool classes for more than one year, we turn to the current year's data. As indicated previously, seventeen of the children attending the preschool classes this year were in their first year of attendance. The other fourteen have been in attendance previously and are in the main the group to whom the longitudinal data we have just discussed pertain. Thus the group of primary interest to us at this juncture is the first-year group. However, we will first examine the data for the total sample to have a frame of reference. Table 2 shows the mean I.Q., mean M.A. and mean C.A. for the total lower- and middle-class groups.

As should be apparent from Table 2, the overall mean I.Q. for the Headstart sample is considerably below that for the middle-class comparison group. In a two-way analysis of variance, the social class effect on I.Q. was highly

Table 2

Means and Standard Deviations for I.Q., M.A. and C.A. for the Lower-Class and Middle-Class Children Attending Ancona Preschool Classes 1968-69 (N = 62)*

	I.Q.		M.A.		C.A.	
	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2
Lower-Class	87.50 (12.18)	91.32 (12.44)	46.20 (12.14)	54.03 (9.53)	52.10 (12.98)	59.23 (12.99)
Middle-Class	116.30 (12.65)	115.62 (13.74)	60.67 (14.75)	67.69 (15.55)	52.74 (11.38)	58.86 (11.83)
Total	101.90 (19.04)	103.07 (17.84)	53.43 (15.25)	60.63 (14.43)	52.43 (12.10)	59.05 (12.34)

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*N = 30 at Time 1 for both groups; N = 31 at Time 2 for Lower-Class group; N = 29 at Time 2 for Middle-Class group.

significant (p less than .001). Time of testing was a non-significant effect. Obviously, mental age also differs for the Headstart and comparison groups, but chronological age is equivalent in the two groups.

From Table 2 it is obvious that the middle-class comparison group did not experience an increase in I.Q. for this academic year. The lower-class group shows a slight increase, but this increase is not statistically significant. As noted above, the lower-class group is composed of children in the school for the first time this year, and children who were continuing in the school. Table 3 shows the intelligence test performance for the sample broken down into children in their first year of attendance and children who are in their second to fourth year at Ancona.

In regard to social-class comparisons, Table 3 shows that the middle-class and lower-class groups are equivalent in chronological age. These groups do differ at a statistically significant level on I.Q. and M.A. when separated by year of attendance. The only group which experienced a noticeable change on I.Q.

Table 3

Means and Standard Deviations for I.Q., M.A. and C.A. for the Ancona Nursery School Sample, by Year of Attendance and Social Class*

	I.Q.		M.A.		C.A.	
	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2
Lower-Class First Year	84.41 (11.86)	91.82 (13.72)	38.41 (8.09)	47.24 (6.49)	45.12 (10.81)	51.53 (10.47)
Middle-Class First Year	115.47 (9.86)	115.13 (11.70)	50.73 (10.20)	58.60 (11.67)	44.56 (7.91)	50.27 (8.38)
Lower-Class Years 2 to 4	91.54 (11.83)	90.71 (11.17)	56.39 (8.39)	62.29 (4.91)	61.23 (9.59)	68.57 (9.10)
Middle-Class Years 2 to 4	117.13 (15.26)	116.14 (16.08)	70.60 (11.61)	77.43 (13.28)	61.47 (7.25)	68.07 (7.02)

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*N = 17 for Lower-Class First Year; N = 13 for Lower-Class Years 2 to 4 at Time 1, 14 at Time 2; N = 15 for Middle-Class First Year; N = 15 for Middle-Class Years 2 to 4 at Time 1, 14 at Time 2.

is the lower-class group in the first year of attendance at the school. This group, in contrast to the 1967-68 sample of Headstart children, started with a lower initial I.Q. (mean = 84). The increase to approximately 92 is not statistically significant at the usual standards but is in the right direction (p approximately .20). As noted earlier, one typically expects an I.Q. increase of half the distance to an I.Q. of 100. It is interesting to note that the performance of the first-year Headstart children confirms exactly to this prediction.

On the basis of these data, we can partially support the hypothesis in question by stating that the lower-class children do show some gain in intelligence test scores. This is the case for children with a low initial score who presumably are more disadvantaged and therefore profit more from the stimulation of preschool experience. One could argue that the changes found here are a reflection of statistical artifact often known as the regression effect. There is no way to completely rule out this possibility, but one might expect a parallel decrease in the middle-class children who are at the same distance above the mean, and no such decrease is present. This suggests that the lower-class increase is not attributable to regression effects.

Piaget data

The Stanford-Binet data were one set of observations relevant to the cognitive development of the sample chidren. The other measures of interest in connection with hypothesis 1a are the performances of the children on the Piaget tasks. In past years of research at Ancona, the program has not been found to have an effect on the children's performance on the Piaget tasks. Kohlberg (1968) concludes that, whereas there is considerable similarity in the theories of Piaget and Montessori, the Montessori curriculum utilizes an essentially perceptual approach to the development of cognition whereas Piaget called for action on objects to spur cognitive change. On the basis of previous years' research at Ancona, we did not expect any marked changes on the Piaget tasks. We did feel it important, however, to administer the tasks again this year in order to verify the trend which had been emerging in previous years.

The performance of the children on the Piaget tasks can be summarized in relation to the conservation and transitivity tasks. It is well to remember that the length transitivity task was only administered to children who were found to be conservers on the length conservation task. For the total sample, a maximum of fourteen children of the sixty-two received the transitivity task at each test time. Of these, nine were middle-class children and five were Headstart children. Table 4 shows the mean conservation sum scores and mean transitivity sum scores for the various groups under study. Maximum scale score on conservation is 7; on transitivity it is 6. The scale points and the percentage of the children reaching each point are shown in Appendix B for the interested reader.

Table 4

Means and Standard Deviations for the Piaget Measures by Social Class and Year of Attendance in the Ancona Nursery School*

	Conservation Sum Scale		Transitivity Sum Scale	
	Time 1	Time 2	Time 1	Time 2
Lower-Class Total	2.93 (1.67) N = 29	2.86 (1.60) N = 29	3.00 (1.60) N = 5	3.25 (1.89) N = 4
Middle-Class Total	3.70 (2.04) N = 30	3.70 (2.38) N = 27	4.88 (1.46) N = 9	4.29 (1.38) N = 7
Lower-Class First Year	2.27 (1.03) N = 15	2.25 (1.13) N = 16	1.00 - N = 1	2.00 - N = 1
Middle-Class First Year	3.25 (1.84) N = 16	3.27 (2.46) N = 15	3.33 (1.16) N = 3	4.00 (1.41) N = 2
Lower-Class Years 2 to 4	3.64 (1.95) N = 14	3.62 (1.81) N = 13	3.00 (2.45) N = 4	3.67 (2.08) N = 3
Middle-Class Years 2 to 4	4.21 (2.19) N = 14	4.25 (2.26) N = 12	5.80 (.45) N = 5	4.40 (1.52) N = 5

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*N's fluctuate slightly as occasionally a child's test was only partially scorable due to procedural errors on the part of the examiner

As can be seen from Table 4, there is virtually no difference in performance on the conservation task from the first administration to the second administration. This is the case for all groups under study. In addition, two-way analyses of variance were performed on these data using social class and time as the main effects. Although the middle-class groups perform at a somewhat higher level in all cases, overall the difference between the two groups does not reach statistical significance. The difference between the first-year middle-class group and the first-year Headstart group in conservation sum scores is significant ($p < .05$).

The transitivity task was administered to a very small subgroup of the total sample. Of interest is the fact that more middle-class children were classified as conservers and therefore received the transitivity task. Otherwise, the small numbers make it inappropriate to analyze the scores for statistical significance.

In general, then, the performance on the Piaget tasks seems essentially unaffected by attendance at the Montessori preschool. This finding is consistent with research at Ancona in previous years (Kohlberg, 1968) and with the broader literature on the modifiability of mental operations studied by Piaget. /In general experimental modification of concrete operations in children has only occurred when the training procedures are very specifically designed to meet the requirements set forth by Piaget (Sigel and Hooper, 1968)./

The scores in Table 4 indicate that most of the children in the Ancona sample cannot be characterized as possessing length conservation with certainty. In terms of task performance, most of the children are able to discriminate length, can remember which stick is longer and generally expect constancy of length for an object. When asked to conserve in a perceptually confusing situation (Disalignment or Deformity) the lack of conservation becomes apparent.

The Piaget tasks usually show a moderate to low correlation with I.Q. In our sample, the correlation for the lower-class group at test Time 1 was -.111; at test Time 2, -.265. For the middle-class group the correlation was .033 at Time 1 and -.077 at Time 2. None is significantly different from zero.

In light of these findings it seems appropriate to conclude that the preschool experience does not affect the acquisition of concrete operations. For future research at Ancona, it suggests that continued assessment of these constructs will not prove fruitful. With this in mind, we have eliminated these procedures from future research plans (OEO proposal, 1969).

Test and teacher ratings

Having examined the measures of cognitive development used in this study, we turn now to measures of characteristics which are thought to be facilitative of school performance. These include the testers' and teachers' ratings of behavior and the modified Birch procedure measures.

In past years' research at Ancona, particularly 1965-66, a number of characteristics rated by the testers and teachers were found to change significantly over the year for the Headstart children (Jensen and Kohlberg, 1966). The ratings which deal primarily with task orientation showed the most change and some showed a correlation with intelligence test change scores. In particular, Distractibility was found to be very high among the entering Headstart children and to show a noticeable decline, particularly for children who showed an increase in I.Q.

We have performed a number of analyses on test and teacher ratings in order to assess the initial status of our group and possible changes which would occur as a result of attendance at Ancona. In particular, we have compared the Headstart children with the middle-class comparison group at both time points to see if the groups differ. Next, we have examined the groups for change from Time 1 to Time 2 to see if their status changed over time. In addition, we have examined the correlations of test and teacher ratings with each other and with intelligence test performance.

The testers' ratings were made in conjunction with the administration of the Stanford-Binet. This year, most of the first tests were administered by two examiners. The second testing was done by three examiners, with only one continuing from first to second testing. Unfortunately, this situation has led to some ambiguity in regard to rating change as the ratings were made by different examiners and there are not enough data to be sure if these raters were working with slightly different sets toward making the ratings. For most purposes, it seems safe to assume that the ratings are roughly comparable. However, teacher ratings are probably less affected by such problems and should take precedence where any ambiguity in results prevails.

As indicated in our section dealing with instruments and procedures, the testers rated fifteen characteristics of the test behavior of the children during the administration of the Stanford-Binet. At approximately the same time, teachers rated twelve characteristics of the children in regard to their classroom behavior. The scales can be categorized broadly into two domains: characteristics dealing with task orientation and characteristics dealing with social relationships, particularly relationships to adults. In past research at Ancona, the ratings dealing with task orientation have shown the most change and have been considered most important in terms of facilitating intellectual change.

The ratings which fall under the general category of task orientation are: Distractibility, Activity Level, Speed of Response-Verbal, Speed of Response-Performance, Initiative with Materials, Self-Confidence on Tasks, Persistence, Reaction to Failure, Sense of Intellectual Challenge, and Willingness to Continue. The scales dealing with the social relationship to the examiner (or teacher) are: Fear of Adult, Social Initiative-Adult, Communication of Affect, and Compliance with Adult. The Verbalization scale which refers to understandability of speech does not conveniently fall into either of these general categories.

In contrast to past years' research at Ancona, the most striking finding this year is the extent to which the middle-class comparison group and the Headstart children are similar to one another on teacher and tester ratings. Means and standard deviations for the teacher and tester ratings are shown in Table 5 for the entire lower- and middle-class sample and for these groups divided by year of attendance.

At Time 1, four ratings differ significantly for the middle-class and Headstart groups. The testers' and teachers' ratings of Verbalization both place the lower-class group below the middle-class in terms of comprehensibility of speech. At

Table 5

Mean Ratings by Testers and Teachers for the Ancona Sample, by Social Class, Length of Attendance and Time

	Lower-Class Total (N = 31)				Middle-Class Total (N = 31)				Lower-Class First Year (N = 17)			
	Time 1		Time 2		Time 1		Time 2		Time 1		Time 2	
Test Ratings	M.	S.D.	M.	S.D.	M.	S.D.	M.	S.D.	M.	S.D.	M.	S.D.
Distractibility	5.5	1.9	5.3	1.9	4.9	2.1	4.1	2.0	5.0	1.8	5.5	2.2
Activity Level	4.1	1.9	4.5	1.7	4.2	1.8	4.5	1.5	4.5	1.9	4.4	1.9
Speed of Response-Verbal	4.2	1.3	5.0	1.7	4.5	1.7	3.9	1.2	4.5	1.3	5.0	1.6
Speed of Response-Performance	3.5	1.1	3.3	1.2	3.6	1.4	2.8	0.9	3.6	1.3	3.1	1.1
Initiative-Test Materials	5.9	1.8	4.1	2.0	5.5	1.7	4.1	1.4	5.7	2.2	3.5	1.9
Self-Confidence on Tasks	5.6	1.4	5.0	1.6	5.6	1.4	5.0	1.5	5.6	1.7	4.5	1.5
Persistence	5.8	1.3	5.4	1.4	5.4	1.4	4.9	1.3	5.7	1.2	5.4	1.5
Reaction to Failure	1.9	1.7	1.9	1.9	2.3	1.7	2.4	1.5	1.4	1.4	1.0	1.3
Sense of Intellectual Challenge	5.6	1.2	5.2	1.5	5.1	1.4	4.5	1.4	5.6	1.2	5.2	1.5
Willingness to Continue	5.6	2.4	5.2	2.0	5.2	2.3	4.4	1.5	5.1	2.4	5.0	2.3
Fear of Adult	4.9	2.1	4.3	1.8	4.5	1.8	3.9	1.7	4.8	2.4	3.9	1.7
Social Initiative with Adult	5.0	2.6	4.4	1.5	4.3	1.7	4.1	1.5	5.1	2.6	4.0	1.4
Communication of Affect	4.6	2.0	4.4	1.7	3.9	1.4	4.3	1.5	4.5	2.1	3.9	1.7
Compliance with Adult	4.8	1.8	4.7	1.5	5.0	1.4	4.4	1.2	4.5	1.6	4.8	1.7
Verbalization	6.2	1.9	4.9	2.6	3.0	1.9	3.3	2.3	6.6	1.3	6.1	1.9
Teacher Ratings												
Distractibility	5.6	1.9	5.9	2.1	5.3	1.9	5.0	2.2	5.6	1.8	6.1	2.3
Activity Level	3.3	1.5	3.8	1.6	4.1	1.4	3.8	1.5	3.6	1.5	4.2	1.5
Initiative-Classroom Materials	3.4	1.8	4.1	1.7	4.4	1.8	4.2	2.0	3.3	1.6	3.6	1.3
Self-Confidence on Tasks	4.1	1.8	4.9	1.9	4.6	1.5	4.8	1.7	3.8	1.5	4.1	1.9
Persistence	5.5	1.4	5.9	1.3	4.9	1.2	5.2	1.4	5.2	1.3	5.8	1.4
Reaction to Failure	2.2	1.9	3.3	1.8	2.7	1.8	2.7	1.6	1.5	1.2	2.8	1.8
Sense of Intellectual Challenge	5.3	1.7	5.5	1.7	4.4	2.0	4.2	2.1	5.6	1.6	6.1	1.6
Fear of Adult	4.1	2.4	3.9	2.3	3.5	2.6	3.5	2.2	3.8	2.3	4.1	2.2
Social Initiative with Adult	4.2	1.9	3.7	1.7	4.0	1.8	3.9	1.7	4.8	2.0	4.1	1.4
Communication of Affect	4.2	1.9	3.3	1.4	3.7	1.9	3.4	1.8	4.2	2.1	3.5	1.4
Compliance with Adult	5.5	1.5	5.6	1.2	5.2	1.4	5.4	1.1	5.5	1.2	5.4	1.1
Verbalization	5.0	2.5	4.8	2.2	2.5	1.8	2.6	1.5	5.0	2.6	5.2	2.4

Middle-Class First Year (N = 16)				Lower-Class 2 to 4 Years (N = 14)				Middle-Class 2 to 4 Years (N = 15)				
Time 1		Time 2		Time 1		Time 2		Time 1		Time 2		
M.	S.D.	M.	S.D.	M.	S.D.	M.	S.D.	M.	S.D.	M.	S.D.	**Test Ratings**
4.9	2.1	4.3	2.0	6.1	1.8	5.0	1.4	5.0	2.2	3.8	2.0	Distractibility
4.2	1.9	4.8	1.7	3.6	1.9	4.6	1.4	4.3	1.8	4.2	1.2	Activity Level
4.4	2.1	4.0	1.3	1.9	1.3	5.0	1.8	4.5	1.2	3.7	1.2	Speed of Response-Verbal
3.6	1.5	2.7	1.0	3.4	0.7	3.6	1.2	3.7	1.4	2.8	0.8	Speed of Response-Performance
4.8	1.9	3.7	1.1	6.2	1.1	4.8	1.8	6.2	0.9	4.5	1.7	Initiative-Test Materials
5.4	1.5	5.1	1.5	5.6	1.2	5.6	1.5	5.7	1.3	4.9	1.6	Self-Confidence on Tasks
5.6	1.5	5.1	1.4	5.9	1.5	5.5	1.5	5.2	1.3	4.6	1.1	Persistence
2.1	1.9	2.5	1.6	2.6	1.8	3.1	2.0	2.5	1.4	2.4	1.4	Reaction to Failure
5.3	1.2	5.0	1.4	5.6	1.3	5.1	1.5	4.9	1.5	4.0	1.3	Sense of Intellectual Challenge
4.8	2.6	4.4	1.7	6.1	2.4	5.4	1.7	5.5	2.0	4.3	1.2	Willingness to Continue
4.4	1.8	4.1	1.6	5.0	1.8	4.7	1.9	4.6	1.8	3.5	1.8	Fear of Adult
4.3	1.9	4.4	1.8	4.9	2.8	4.8	1.5	4.3	1.5	3.8	1.2	Social Initiative with Adult
3.7	1.5	4.7	1.7	4.8	1.9	5.1	1.5	4.2	1.3	3.9	1.2	Communication of Affect
5.0	1.3	4.1	1.4	5.2	2.1	4.6	1.3	5.1	1.5	4.7	0.9	Compliance with Adult
3.5	1.8	4.1	2.2	5.6	2.4	3.4	2.6	2.5	1.9	2.5	2.0	Verbalization
												Teacher Ratings
5.6	1.5	5.6	1.8	5.5	2.2	5.6	1.8	4.9	2.3	4.4	2.4	Distractibility
4.2	1.5	3.9	1.2	3.0	1.5	3.3	1.7	4.0	1.4	3.8	1.8	Activity Level
4.4	1.8	3.9	1.8	3.6	2.0	4.6	1.9	4.4	1.8	4.4	2.2	Initiative-Classroom Materials
4.6	1.7	4.9	1.8	4.6	2.3	5.9	1.6	4.5	1.2	4.8	1.7	Self-Confidence on Tasks
5.4	1.1	5.4	1.4	5.8	1.5	6.0	1.3	4.3	1.1	4.9	1.4	Persistence
2.3	1.7	2.7	1.8	3.3	2.3	3.9	1.7	3.2	1.7	2.7	1.5	Reaction to Failure
5.3	1.8	5.2	2.1	5.0	1.9	4.7	1.6	3.4	1.9	3.2	1.8	Sense of Intellectual Challenge
3.6	2.5	3.6	2.1	4.6	2.5	3.7	2.5	3.4	2.7	3.4	2.3	Fear of Adult
4.1	1.9	3.9	1.9	3.5	1.4	3.3	2.0	3.9	1.7	3.9	1.6	Social Initiative with Adult
3.9	2.2	3.5	1.8	4.1	1.6	2.9	1.4	3.5	1.5	3.4	1.9	Communication of Affect
5.3	1.7	5.1	1.0	5.5	1.9	5.9	1.3	5.2	1.1	5.8	1.2	Compliance with Adult
3.1	2.0	3.0	1.7	5.0	2.3	4.2	2.0	1.8	1.3	2.1	1.2	Verbalization

Time 1, the level of the ratings on Verbalization made by testers indicates some difficulty in understanding the speech of the Headstart children; the teachers' ratings signify errors in the speech but that the children's speech is easily understood. At Time 2, both testers and teachers characterize the speech as easily understood but still containing errors. In contrast, the speech of the middle-class comparison group is rated as very good with only occasional errors. A two-way analysis of variance on the teachers' ratings of Verbalization with social class and time as the main effects shows a highly significant effect for social class ($p < .001$) and no significant effect of time. For the parallel analysis on the testers' ratings, there is a highly significant effect of social class ($p < .001$) and a significant interaction ($p < .05$) indicating the shift in testers' ratings for the lower-class group from Time 1 to Time 2 in the direction of improved speech.

In addition to the ratings of Verbalization, teachers' ratings of Activity Level and Initiative with Classroom Materials show social-class differences at Time 1. The Activity Level rating indicates that the Headstart children are quite active but exhibit control of their own activity, whereas the comparison children are slightly less active. The mean ratings for both groups are within the desirable range of the scale.

On Initiative in Dealing with Classroom Materials the Headstart children show a tendency to begin to handle materials and think they know what to do, whereas the comparison children are more likely to wait for help, but be eager to begin. Again, the mean level of these ratings is roughly within desirable limits.

Overall, then, the two groups of children entered Ancona with highly similar characteristics in regard to task orientation and social relationships with adults. This generalization holds for all children when viewed as total groups, but is the picture different when the children are split by year of attendance?

At Time 1, the first-year Headstart children differ from the middle-class children on only one characteristic: Verbalization. This difference is manifest both on teacher and tester ratings and has been discussed in conjunction with the group as a whole. The older children who were in their second to fourth year of attendance differ from their middle-class counterparts on Verbalization (tester and teacher) and on teachers' ratings on Persistence and Sense of Intellectual Challenge. The Persistence rating shows some tendency for the Headstart children to try things but to give up after one or two unsuccessful attempts, whereas the middle-class children persist through more tries. The ratings on Sense of Intellectual Challenge indicate that the Headstart children expend effort on a problem which is appropriate to the level of difficulty of the problem, but there is no sense of intellectual challenge. The comparison group places special effort on hard tasks. On these two ratings, the comparison group clearly exhibits more desirable behavior from the point of view of school success, although the behavior of the Headstart children is not extreme.

The difference on these two variables suggests that the older Headstart children, while generally well acclimated to school requirements, lack the extra push or drive for learning which is present in the comparison group. This difference in achievement orientation may well predict to a difference in the long-range achievement of the two groups. This difference may well be the difference between adequate performance and outstanding performance. It goes hand in hand in this sample, of course, with a marked difference in intellectual level.

It seems, however, that the overall behavior of the two groups at the beginning of the school year has much more in common than might have been anticipated. This is particularly the case for the first-year group. What of the ratings at Time 2?

At Time 2, the first-year Headstart group again differs from the comparison group on Verbalization. On testers' ratings, both groups show non-significant gains from Time 1 to Time 2, leaving the relative position unchanged. Teachers' ratings also leave essentially the same between-group difference. The only other scale which shows a significant difference at Time 2 is the testers' rating of Reaction to Failure. The Headstart children are rated as aware of failure but as not exhibiting discomfort due to failure. The comparison group exhibits some discomfort at failure.

At Time 2, the older children again exhibit differences on Verbalization, Persistence and Sense of Intellectual Challenge. At the second administration, only the teachers' ratings of Verbalization were significantly different for the two groups. However, on this occasion both testers and teachers saw significant differences on Sense of Intellectual Challenge. In addition, the testers rated the Headstart children as slower on Response to Verbal Items and as more inhibited in Communication of Affect. However, in both cases the mean level for the Headstart group was within desirable limits.

In general, then, at both the beginning and end of the school year, the ratings of behavior show a high degree of similarity between Headstart and middle-class children. The first-year group seems most similar.

There are a number of possible explanations for the similarity in ratings for the children. To the extent that the ratings are an accurate reflection of behavior (and their consistency, evidenced by significant positive correlation from Time 1 to Time 2 for teachers on almost all scales and for testers on many scales, would suggest they are) the Headstart children really are much like middle-class young children on the characteristics examined. One contributing factor may be the frequent contact of the social worker with the families that had new children in the school (see Appendix C) and the excellent attendance record made by these children. It is also possible that as the staff has become more experienced with Headstart children any preconceptions they may have had in regard to group differences have been replaced with a clearer perception of the children as individuals.

It is not possible to fully explain the lack of social-class differences this year in contrast to years past. However, the direction of the differences which emerge for the older children may well reflect the curricular requirements. Persistence and desire to deal with difficult tasks clearly become more important as the children move through the Montessori curriculum. Thus the differences, which might be operative earlier, only become apparent and of importance when the teachers rate the older children.

In addition to examining social-class differences, it is possible to look at each group and ask if there were any significant changes from Time 1 to Time 2 for the group in question. We have examined these changes and found very few which meet the statistical criterion for significance. In particular the first-year lower-class group showed a significant change on Initiative in Dealing with Test Materials (from waiting for instructions to beginning on one's own); a change on Self-Confidence on Tasks (in the direction of more confidence); and a change on the teachers' ratings of Reaction to Failure (toward some discomfort with failure). These three changes all seem to reflect a growing ease and familiarity with the testing situation and the learning milieu and place the Headstart children at approximately the same level on the scales as their middle-class comparison group. Other changes on the scales, although not statistically significant, are in general all desirable changes.

The second- to fourth-year group of Headstart children showed changes on two scales and they were both testers' ratings. The scales were Initiative in Dealing with Test Materials (from a lack of "set" prior to instructions to waiting for instructions but eager to begin) and Verbalization (from adequate speech with errors to occasional errors). Again, the direction of most other changes was in a desirable direction.

The middle-class first-year group showed one significant shift. Their Response to Performance Items on the test became faster. The middle-class older children showed one significant change. Their ratings on Initiative with Test Materials changed from exactly the same level as the Headstart children of their age to the same final level as the Headstart children.

As indicated in our statement of hypotheses there were two ways in which we hoped to get at changes in task attentiveness and orientation in the children. The first set of measures was the teachers' and testers' ratings which we have just discussed. The ratings showed a highly similar pattern for Headstart and comparison children, with few major changes across the year. Where changes did occur, however, they could be characterized as positive or in the direction of better adjustment to the requirements of schooling. The overall picture is one of ratings which fall within the limits of desirable behavior for both groups.

The ratings are generally uncorrelated with intelligence test performance when examined for social-class groups separately, suggesting considerable independence of procedures. The lack of correlation between the behavioral ratings and I.Q. scores is somewhat puzzling to us. We do not have strictly comparable data from the past research at Ancona, as correlations were only computed between ratings and I.Q. change scores in the past. We chose to examine correlations for total scores at both times and found few significant relationships between ratings and I.Q. This suggests that the behavioral ratings are not predictive of cognitive level per se in this year's students. It is possible that this is largely a function of the similarity in level of ratings for all children in this year's study group. The highly similar performance on ratings may, in the long run, be predictive of academic achievement; however, we have no evidence with which to investigate this question.

It is also possible that the ratings really do not assess characteristics which are central to cognitive development, but we cannot support or refute this proposition at the moment. It is true that the ratings are most closely tied to achievement characteristics.

Last, it is possible that the ratings would significantly predict to I.Q. change for individuals, but we did not feel it appropriate to investigate this through the use of change scores due to statistical difficulties inherent in such an analysis.

Birch procedure

We now turn to the other set of measures which assesses task orientation: the Birch procedure. The Birch procedure is a method for categorizing children's responses to cognitive demands which was developed by the University of Hawaii Headstart Evaluation and Research Center from the procedure reported by Hertzig, Birch, Thomas, and Mendez (1968). It was used by its original authors, and by us, to categorize children's responses to task demands on the Stanford-Binet test. The system of categories is described by its authors as arising from the objective possibilities for responding, expressed as a logic tree. Responses are first categorized as work responses (the child attempts to do the task) or not-work responses. Each of these two types of responses is then divided into verbal and non-verbal categories. Within the work response category, both verbal and non-verbal responses are divided into two categories: (1) delimited responses, which do not go beyond the requirements of the task, and (2) responses which are verbal or non-verbal extensions of work responses (spontaneous associations or other expressions in action or speech). Within the not-work response category, verbal not-work respnses may be expressed in four ways: (1) competence (statements related to the child's ability to do the task), (2) negation (refusal to do the task), (3) aid (requests for help from the examiner), and (4) verbal substitution (verbal responses irrelevant to the task). Non-verbal not-work responses may be expressed in four ways: (1) negation (motor responses directly expressing refusal), (2) non-verbal substitution (motor responses which are irrelevant to the task), (3) non-verbal responses accompanying requests for aid, and (4) passive non-response.

The Hawaii revision of the Birch procedure maintains this category system with one revision: non-verbal not-work responses are divided into just two categories, non-verbal substitution and non-response. This collapsing of categories was done because of the frequent difficulty of distinguishing non-verbal negation from passive non-response. A second revision in the Hawaii system is that when verbal and non-verbal responses occur simultaneously, only the verbal response is coded. In the system described by Hertzig, _et_ _al_., both responses were coded. A third revision in the Hawaii procedure is that delimited work responses are categorized as verbal or non-verbal on the basis of the item demand rather than the actual response (a procedure which, in practice, makes little difference in the categorization of responses as verbal or non-verbal). Finally, the most important revision by the Hawaii group is that only final responses to a test item are coded, whereas Hertzig, _et_ _al_. coded all responses.

Within the categories of responses described by the Birch procedure, it is possible to distinguish categories which are related to task orientation and categories which are related to preference for verbal or non-verbal response. We focused upon these two broad categories of response types, which we thought might reflect changes in the children in the Ancona program.

We distinguished the following six measures based on Birch procedure categories which we considered to be related to task orientation:

(1) Percentage of items with final work response.

(2) Percentage of verbal not-work responses which were verbal substitutions (indicative of lack of task orientation).

(3) Percentage of verbal not-work responses which were competence statements.

(4) Percentage of verbal not-work responses which were requests for aid.

(5) Percentage of verbal not-work responses which were negations (indicative of lack of task orientation).

(6) Percentage of non-verbal not-work responses which were non-verbal substitutions. (The complement of this category is passive non-response, which is at least less clearly lacking in task orientation than is non-verbal substitution.)

We distinguished four measures based on the Birch procedure categories which we considered to be related to preference for verbal response:

(1) Percentage of verbal items with final work response, as compared with percentage of non-verbal items with final work response.

(2) Percentage of not-work responses which were verbal.

(3) Percentage of work responses with verbal extensions.

(4) Percentage of work responses with non-verbal extensions.

In addition to the two broad categories of task orientation and preference for verbal response, we also included in our analysis measures of examiner questioning patterns which are provided by the Hawaii revision of the Birch procedure.

(1) Ratio of the number of examiner questions following initial presentation of a test item to the number of test items.

(2) Percentage of these additional examiner questions which were prompted by non-verbal response of a child.

For each child administered a Stanford-Binet, the Birch procedure coding system was also completed, and the twelve scores described above were computed for each child.

Comparison of the Ancona results to the results reported by Hertzig, et al. While none of our Birch procedure measures were computed exactly as the measures reported in the Hertzig, et al. (1968) monograph, a number of our measures were roughly comparable to the Hertzig measures, the only difference being that our measures were computed for final responses only, while the Hertzig measures were computed for all responses, and that our measures were computed for each child separately and then averaged, while the Hertzig measures were computed for a group's responses taken all together.

Table 6 shows these measures computed for the subgroups in our sample most comparable to the Hertzig sample, and these measures as reported for the Hertzig sample. From our sample, we chose only scores on the first test for children in

Table 6

Comparison of Birch Procedure Results in the Ancona Research with Results Reported by Hertzig, Birch, Thomas and Mendez (1968)

	Ancona Sample			Hertzig, et al. Sample		
	Lower-Class First Year in Program	Middle-Class First Year in Program	Signif. Level Social-Class Difference	Working-Class	Middle-Class	Signif. Level Social-Class and Ethnic Difference
Task Orientation Measures*						
Proportion work responses	.898	.890	NS	.64	.72	.001
Proportion verbal substitution	.246	.180	NS	.64	.28	.001
Proportion competence	.740	.781	NS	.10	.40	.001
Proportion aid	.014	.005	NS	.11	.10	NS
Proportion negation	.000	.034	.10	.15	.22	.001
Proportion non-verbal substitution	.436	.303	NS	.43	.48	.05
Measure of Preference for Verbal Response*						
Proportion verbal not-work	.555	.760	NS	.38	.59	.001

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*In the Ancona sample, these measures are proportions of final responses only, whereas in the Hertzig, et al. sample they are proportions of all responses. In the Ancona sample, the measures of proportion were computed for each child separately, and then averaged. In the Hertzig, et al. sample, the measures of proportion were computed for all responses of a group taken together.

the first year of the program, since this group was most comparable in age to the Hertzig sample. (Our lower-class first-year group had a mean age of forty-five months, S.D. 10.81. Our middle-class first-year group had a mean age of forty-five months, S.D. 7.91. The Hertzig sample was slightly younger than ours, and less variable in age: working-class forty-two months ± 2.54; middle-class forty months ± 2.47.) The Hertzig sample also differed from ours in ethnic composition of the groups: their working-class children were Puerto Rican and their middle-class children native-born white. Our lower-class children were Negro and our first-year middle-class children were approximately 75% Negro and 25% white.

Inspection of Table 6 shows greater task orientation in our sample of responses than in the Hertzig sample. This is evident in the higher proportion of work responses in our sample, in the higher proportion of competence responses, and the lower proportions of verbal substitutions and negation responses. In fact, our sample shows a very low frequency of aid and negation in contrast to Hertzig. It might be argued that the use of the final response only in the Hawaii system leads to an inflated assessment of the tendency to give work responses. This factor must be borne in mind, but in fact in the great proportion of responses given by the children the first response was almost always the final response as well.

Particularly striking in contrasting the Ancona group with the Hertzig group is the reversal in the use of competence and verbal substitution mechanisms as reasons for not-working on the task. Our children assess their competence and use this as the primary reason for not-working; they recognize their own limitations. The Hertzig sample, particularly the lower-class Puerto Rican children, rarely refer to competence and instead attempt verbal substitutions which are really irrelevant to the task.

The higher level of task orientation in our sample is coupled with a lack of social-class difference in most measures of task orientation where Hertzig, et al.

found social-class differences. This is true for proportion of work responses and proportional distribution of types of verbal not-work responses. One of our task orientation measures shows a substantial, though non-significant social-class difference: there is a greater proportion of non-verbal substitutions (as compared with other non-verbal not-work response types) in our lower-class group than in our middle-class group, a finding opposite to that of Hertzig, *et al*.

The single measure of preference for verbal response shows a substantial, though non-significant social-class difference in our sample which is consistent with the social-class difference found by Hertzig, *et al*.: the middle-class group shows a greater tendency to express not-work responses verbally. But on this measure, as on the others, our sample shows a higher proportion of verbal not-work responses than the Hertzig, *et al*. sample.

It is important to note that the ethnic composition of the two samples is different. We are comparing children from two social-class groups, as Hertzig did, but from a different ethnic group. Comparison of these findings strongly suggests that the difference in response to cognitive demands which Hertzig found is probably more a function of Puerto Rican life style (or ethnicity) than it is of social class. This suggestion seems worthy of further study and is consistent with the interpretation of results presented by Hertzig.

The finding of no substantial social-class differences in our sample is also of interest in connection with the data based on test and teacher ratings. As in that case, this group of first-year children looks highly similar to their middle-class counterparts and exhibits a very adequate level of task orientation. The consistency of findings from these various measures makes a strong case for the veracity of this assessment of similarity, even considering that test ratings and the Birch measures are derived from the same testing session (the teachers' assessments are of course independent).

Having compared our younger children with the Hertzig, *et al*. sample, we can now look at the findings for the Ancona sample as a whole and examine any patterns of change which occurred from Test 1 to Test 2.

Table 7 shows the twelve scores of task orientation, preference for verbal response, and examiner questioning patterns which were described above, computed for our lower-class and middle-class samples at each test time. As was the case for the first-year children, the total lower-class and middle-class groups are extremely similar in response patterns. Social-class differences found in the total sample are confined to types of not-work responses. Middle-class children more often express not-work responses verbally, and within the category of not-work responses expressed verbally, middle-class children give more negation responses and fewer verbal substitution and aid responses. An additional social-class difference is the greater proportion of examiner's questions prompted by non-verbal response which was found in the lower-class group. This probably is a result of the fact that not-work responses were more often non-verbal in the lower-class children.

The only measures which showed change over time for the full lower-class and middle-class samples were percentage of verbal extensions to work responses, which declined in the middle-class group, and ratio of examiner questions to items, which decreased in both groups. We believe the decrease in examiner questions is a function of examiner style as there was a change of examiners from Test 1 to Test 2. One of the authors (Judith Jensen) did much of the testing at Time 1 and has observed and trained the other testers. She believes that she tends to question more than testers who replaced her at Time 2. It is, however, possible that this change reflects less of a need for clarification of responses at the second testing time.

For four subgroups divided by social class and length of time in the program, only one change over time was even marginally significant: for the middle-class second- to fourth-year group there was an increase in percentage of not-work

Table 7

Birch Procedure Measures in Lower-Class and Middle-Class Groups at Two Test Times

	Lower-Class		Signif. Level Lower-Class Time 1-2 Difference	Middle-Class		Signif. Level Middle-Class Time 1-2 Difference	Signif. Level Lower-Class/ Middle-Class Time 1 Difference	Signif. Level Lower-Class/ Middle-Class Time 2 Difference
	Test 1	Test 2		Test 1	Test 2			
Task Orientation Measures								
Percentage work	88.37	88.08	NS	87.80	86.71	NS	NS	NS
Percentage verbal substitution	13.09	22.91	NS	9.54	9.02	NS	NS	.10
Percentage competece	86.18	75.69	NS	87.25	88.75	NS	NS	NS
Percentage aid	0.72	1.01	NS	0.50	0.44	NS	NS	.10
Percentage negation	0.00	0.39	NS	2.71	1.79	NS	.05	NS
Percentage non-verbal substitution	23.99	17.07	NS	18.52	26.67	NS	NS	NS
Measures of Preference for Verbal Response								
Percentage work to verbal items	81.84	82.31	NS	84.22	82.43	NS	NS	NS
Percentage work to non-verbal items	97.67	98.38	NS	97.15	97.83	NS	NS	NS
Percentage verbal not-work	60.30	53.68	NS	77.09	87.09	NS	.10	.001
Percentage verbal extensions	7.12	3.76	NS	7.76	4.67	.10	NS	NS
Percentage non-verbal extensions	3.63	2.17	NS	4.62	3.28	NS	NS	NS
Examiner Questions								
Ratio questions to items	.082	.061	.10	.103	.069	.01	NS	NS
Percentage questions to non-verbal response	23.8	18.9	NS	12.0	6.5	NS	.05	.05

responses expressed verbally ($p < .10$). Thus, the statistically significant changes which did occur were limited to measures of preference for verbal response in the middle-class group, and number of supplementary questions given by examiners.

The general lack of change on the Birch measures seems to indicate a rather stable response style in the Ancona sample. Taken with the generally desirable level of work response and task orientation exhibited by the children initially, the lack of change is not discouraging. In fact the behavior of our sample children as exhibited on the Birch measures and on ratings seems very close to optimal at the start of the school year and little improvement could be expected. The one area which is an exception is in Verbalization for the lower-class children, an area to which we will address ourselves in hypothesis 3.

Social interaction and sociometric choices

Because the Ancona school program provides a setting which is integrated both by social class and by race, we are interested in the way in which social interaction develops among the children, and particularly in the development of social interaction between social-class groups. We have investigated social interaction among the children, using both sociometric and observational techniques, with a view to testing the hypothesis that interaction between middle-class and disadvantaged children will increase over a year-long program, and that this increase will be facilitated by common interests and shared activities.

The development of cross-group friendship choices was investigated using a sociometric test which follows the procedure developed by McCandless and Marshall (1957). In this procedure the child is seated before a large board containing photographs of all his classmates, is asked first to identify all the children, and then is asked for sociometric choices. We asked the children to name three children with whom they would like to play and two children with whom they would not like to play. In addition to our interest in cross-group friendship, we were also interested in the children's racial attitudes toward Negro and white children.

A second part of our sociometric test was designed to investigate racial attitudes: we repeated the procedure used in the first part of the test, while presenting pictures of children in another classroom, whom the child did not know, and who differed according to race and sex.

Table 8 presents the distribution of positive and negative choices in the child's own classroom, according to the social class and race of the child chosen, for lower-class and middle-class groups and for sub-groups differing according to length of time in the Ancona program. On the first sociometric test, administered during the early part of the school year, the children's choices of lower-class Negro, middle-class Negro, and middle-class white and oriental children did not differ from the proportions of these groups in the classroom. Furthermore, children within a social-class group who were new to the program did not differ in distribution of their choices from children who had been enrolled in previous years.

On the second test, administered at the end of the year, group patterns of choice emerged which differed from actual classroom distributions. Among the middle-class children, children who had been in the program in previous years made more friendship choices across social-class lines: there were more positive choices of lower-class Negro children and fewer positive choices of middle-class white children in this group than among middle-class children new to the program. While it is true that the middle-class second- to fourth-year children were predominantly Negro, it is also true that these proportions of white and Negro children in the two groups held for the first testing as well, when no differences by year of enrollment were found. Thus it seems that the difference found on the second testing cannot be attributed to the race of the middle-class children.

Lower-class children also differed by year of enrollment in positive choices on the second test. Children who had been enrolled in previous years increased

Table 8

Social-Class and Racial Distribution of Sociometric Choices in Own Classroom

	% Negro in Sample Group		% Distribution Test 1 Choices				% Distribution Test 2 Choices			
	Test 1	Test 2	Lower-Class Negro	Middle-Class Negro	Middle-Class White/ Oriental	Signif. of Difference from Actual Distribution by x^2 Test	Lower-Class Negro	Middle-Class Negro	Middle-Class White/ Oriental	Signif. of Difference from Actual Distribution by x^2 Test
Actual Classroom Distribution for Test of Middle-Class Child			21.0	35.4	43.6		19.7	33.6	46.7	
Middle-Class Positive Choices										
All Middle-Class	57	50	15.6	35.6	48.9	NS	16.6	33.3	50.0	NS
Middle-Class First Year	75	73	16.7	39.6	43.8	NS	10.0	32.5	57.5*	NS
Middle-Class 2nd to 4th Year	36	18	14.3	31.0	54.8	NS	25.0	34.4	40.6*	NS
Middle-Class Negative Choices										
All Middle-Class	57	50	27.3	38.2	34.5	NS	42.0	44.0	16.0##	.001
Middle-Class First Year	75	73	25.9	44.5	29.6	NS	35.7	50.0	14.3	.005
Middle-Class 2nd to 4th Year	36	18	28.6	32.1	39.3	NS	50.0	36.3	18.2#	.001
Actual Classroom Distribution for Test of Lower-Class Child			16.8	37.8	45.5		15.8	35.5	48.7	
Lower-Class Positive Choices										
All Lower-Class	100	100	21.8	35.6	42.5	NS	24.4	29.5	46.2	NS
Lower-Class First Year	100	100	18.8	41.6	39.6	NS	15.9	34.1	50.0**	NS
Lower Class 2nd to 4th Year	100	100	25.6	28.2	46.2	NS	35.3	23.5	41.2**	.01
Lower-Class Negative Choices										
All Lower-Class	100	100	16.7	38.9	44.4	NS	16.7	47.9	35.4	NS
Lower-Class First Year	100	100	12.9	35.5	51.6	NS	14.8	51.9	33.3	NS
Lower-Class 2nd to 4th Year	100	100	21.7	43.5	34.8	NS	19.0	42.9	38.1	NS

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*Difference between distribution of 1st year and 2nd to 4th year groups significant at $p < .05$; ** at $p < .01$.
#Difference between distributions at Test 1 and Test 2 signficant at $p < .05$; ## at $p < .01$.

in the proportion of positive choices within their own social-class group to a level of choice disproportionate to the percentage of lower-class children actually in the classrooms, while new lower-class children did not change in distribution of choices.

The most consistent and most striking changes which occurred on the second sociometric test were in negative choices by middle-class children. All of the middle-class children increased in negative choices of Negro children. For middle-class children with longer tenure in the program, the increase was specifically in negative choice of lower-class Negro children. Both middle-class groups deviated significantly in their choices from actual distribution of children in the classroom. In contrast, lower-class children did not deviate in their negative choices from actual distribution of children in their classrooms.

In summary, our sociometric study of friendship choices in the child's own classroom showed first that social class was an important factor in the choice of friends, though in different ways for the two social-class groups: with longer tenure in the program, middle-class children increased their friendship choices across social-class lines, while lower-class children decreased in cross-class choices. Second, we found race, or race and social class, to be associated with being disliked by children: for younger middle-class children who were new to the program, race was the most important factor; for older middle-class children, social class was most important.

The sociometric choices given by the children in the second part of our test, the study of racial attitudes, are shown in Table 9. On the first test racial distribution of the children's choices from among pictures of children whom they did not know did not differ from the actual proportions of Negro and white children pictured. Deviations from actual proportions of pictured children did occur on the second test, however. The greatest difference occurred in negative choices by the older lower-class children with longer tenure in the program. These children increased on the second test to a disproportionately high negative choice

Table 9

Racial Distribution of Sociometric Choices in Other Classroom

	% Negro in Sample Group		% Distribution Test 1 Choices		Signif. of Difference from Actual Distribution by x^2 Test	% Distribution Test 2 Choices		Signif. of Difference from Actual Distribution by x^2 Test
	Test 1	Test 2	Negro	White/ Oriental		Negro	White/ Oriental	
Actual Classroom Distribution			56.4	43.6		53.2	46.8	
Middle-Class Positive Choices								
All Middle-Class	57	50	41.5	58.5	NS	35.9	64.1	.10
Middle-Class First Year	75	73	43.9	56.1	NS	32.3	67.7	.10
Middle-Class 2nd to 4th Year	36	18	37.5	62.5	NS	40.9	59.1	NS
Middle-Class Negative Choices								
All Middle-Class	57	50	58.1	41.9	NS	59.1	40.9	NS
Middle-Class First Year	75	73	50.0	50.0	NS	54.2	45.8	NS
Middle-Class 2nd to 4th Year	36	18	68.5	31.5	NS	65.0	35.0	NS
Lower-Class Positive Choices								
All Lower-Class	100	100	60.4	39.6	NS	66.3	33.7	NS
Lower-Class First Year	100	100	60.0	40.0	NS	68.9	31.1	.10
Lower-Class 2nd to 4th Year	100	100	61.1	38.9	NS	62.5	37.5	NS
Lower-Class Negative Choices								
All Lower-Class	100	100	64.0	36.0	NS	74.5	25.5	.05
Lower-Class First Year	100	100	66.7	33.3	NS	69.3	30.7	NS
Lower-Class 2nd to 4th Year	100	100	60.9	39.1	NS	81.0	19.0#	.05

#Difference between distributions at Test 1 and Test 2 marginally significant: $p < .10$.

of Negro children. The younger, newer children in both lower-class and middle-class groups showed a tendency toward racially-determined positive choices, with lower-class children showing more positive choice of Negro children and middle-class children showing more positive choice of white children.

Apart from the choices of new lower-class children, who tended to choose more Negro children both positively and negatively, these results reflect a more positive attitude toward white children, particularly among the middle-class group, and a more negative attitude toward Negro children, particularly among the lower-class group. Previous research (Ammons, 1960; Stevenson and Stewart, 1958) with Negro and white preschool children has shown negative valuation of Negro children and positive valuation of white children to increase with age. Our results for our lower-class group are consistent with this age change: the older children show a more negative attitude toward Negro children.

To complement our sociometric study of the children's friendship choices and racial attitudes, and to aid in understanding the sociometric choices, we made a series of classroom observations on each child in our sample. Using a time sampling technique, we extended a series of forty-two one-minute observation periods for each child over a total of six observation days. These forty-two minutes of observation yielded 168 fifteen-second time segments in which we recorded the first social act which occurred. On the average, we coded a total of nearly seventy acts for each child. The average number of social acts coded did not differ for the two social-class groups in our sample, although the new, younger children in each social-class group had fewer acts per child than the older children. Acts were coded according to fifteen categories of aggressive, dominance-submission, affiliative, and withdrawing behaviors. The two social-class groups, and the subgroups within them, showed little difference from one another in distribution of social acts within the fifteen categories. On the average, half of all social acts recorded were coded as affiliative, and within the category of affiliative acts over 90% were coded in a general "affiliation" category, which included conversations and similar means of giving and seeking social response. About 40% of all acts were coded in the general category of dominance-submission. Such acts often centered around common activities, and the four codes within this general category ranged from submissive through cooperative to controlling acts. Over half of the acts in the dominance-submission category were coded as "cooperative interaction." The general category of aggressive acts accounted for about 9% of the total acts, and withdrawing acts for less than 1%.

In addition to coding the type of social act, we also noted the name of the child to whom the act was directed, and later categorized the children according to race and social class. Table 10 shows the distribution of social acts by our sample groups according to the race and social class of the child to whom the act was directed. For both social-class groups, we found that the distribution of total social acts differed from the actual proportions of racial and social-class groups in the classroom at a statistically significant, or marginally significant level. However, distribution of social acts by the middle-class children does not differ very much from actual distributions in the classroom, while the distribution of acts by lower-class children shows strong deviation. To the extent that the middle-class children do deviate from actual proportions in the classroom, the first-year middle-class children (who are predominantly Negro) tend to direct more social acts to middle-class Negro children; the middle-class second- to fourth-year children differ from the younger group in that they direct fewer acts to middle-class Negro children and more to lower-class Negro children. The older middle-class group comes the closest of any group to approximating in the distribution of social acts the actual proportions of racial and social-class groups in the classrooms.

The two lower-class groups show strong directionality in the distribution of their social acts. Both groups direct relatively few acts to middle-class white

Table 10

Social-Class and Racial Distribution of Social Acts in the Classroom

			% Distribution of Social Acts			
	% Negro in Sample Group	Total No. of Social Acts Coded	Lower-Class Negro	Middle-Class Negro	Middle-Class White/ Oriental	Signif. of Difference from Actual Distribution by x^2 Test
Actual Classroom Distribution for Middle-Class Child			18.9	33.9	47.2	
Middle-Class Total Acts						
All Middle-Class	53.6	1929	19.1	37.8	43.1	.001
Middle-Class First Year	73.3	996	16.8	41.2	42.1*	.001
Middle-Class 2nd to 4th Year	30.8	932	21.6	34.2	44.2*	.10
Middle-Class Dominance-Submission Acts						
All Middle-Class	53.6		21.1	36.1	42.8	
Middle-Class First Year	73.3		14.5	39.0	46.4	
Middle-Class 2nd to 4th Year	30.8		28.9	32.8	38.2	
Middle-Class Affiliation Acts						
All Middle-Class	53.6		17.5	38.5	44.0	
Middle-Class First Year	73.3		18.1	43.6	38.2	
Middle-Class 2nd to 4th Year	30.8		16.8	33.1	50.1	
Actual Classroom Distribution for Lower-Class Child			15.1	36.4	48.5	
Lower-Class Total Acts						
All Lower-Class	100	1879	29.3	39.1	31.6	.001
Lower-Class First Year	100	818	16.5	49.3	34.2*	.001
Lower-Class 2nd to 4th Year	100	1060	39.2	31.2	29.6*	.001
Lower-Class Dominance-Submission Acts						
All Lower-Class	100		31.1	38.1	30.8	
Lower-Class First Year	100		16.7	52.7	30.6	
Lower-Class 2nd to 4th Year	100		42.1	27.0	30.9	
Lower-Class Affiliation Acts						
All Lower-Class	100		29.2	40.0	30.8	
Lower-Class First Year	100		17.1	48.2	34.8	
Lower-Class 2nd to 4th Year	100		38.7	33.7	27.7	

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*Difference between distribution of first-year and second- to fourth-year groups significant at $p < .001$.

children in proportion to the number of those children. New lower-class children direct a large proportion of their social acts to middle-class Negro children, while lower-class second- to fourth-year children direct a large proportion of acts to other lower-class Negro children.

Proportional distribution of the dominance-submission and affiliative categories of acts generally follows the distributions of total acts. The older middle-class children show the greatest variation in distribution according to type of act: they direct more dominance-submission acts to lower-class Negro children and more affiliative acts to middle-class white children. The distribution by type of social act suggests that increasing cross-class choice by these older middle-class children occurs around shared activities in the classroom rather than around acts engaged in simply for social contact.

The results of the social interaction observations show strong consistency with the children's friendship choices on the second of our two sociometric tests. The middle-class group which is older and has longer tenure in the program makes more friendship choices and directs more social acts to the lower-class Negro children than the first-year middle-class group. The older lower-class children direct a disproportionate number of social acts within their own social-class group and increasingly make within-group friendship choices. Only for the younger lower-class children is there a lack of consistency between the two measures. This group shows a strong tendency to direct social acts to middle-class Negro children which is not reflected in positive sociometric choices. Two lines of evidence suggest that the interaction of these younger lower-class children with the middle-class Negro children may not have been strongly positive in character: first, a greater share of the social acts are dominance-submission acts, a category in which the younger lower-class children tended more toward extremes of dominance and submissive behavior, as compared with cooperative interaction, than any other group; and second, there is a greater tendency on the second test to negative choice of middle-class Negro children than to positive choice of this group.

Our hypothesis that interaction across social-class lines will increase over time in the Ancona program, and will be facilitated by shared activities, was confirmed for our middle-class group only. In this group, children with longer tenure in the program made a greater proportion of friendship choices of lower-class children, and directed proportionately more acts of cooperative play to the lower-class group, than did the middle-class children who were new to the program. The evidence for our lower-class group is contrary to our hypothesis. While younger lower-class children who were new to the program directed a large share of social acts across social class, but within racial lines, our older lower-class children increasingly made friendship choices and directed social acts within their social-class group.

The results for choice of disliked children and for racial attitudes toward unknown children contrast sharply with the results for friendship and play choices. The middle-class children show a strongly negative attitude toward Negro children in their classroom and, more particularly with longer tenure in the program, toward lower-class Negro children, although they do not generalize this into a negative attitude toward unknown Negro children. The lower-class children do not choose disliked children in their classroom from any particular social-class or racial group, but with longer tenure in the program they show an increasingly negative attitude toward unknown Negro children.

In general, it seems that as the middle-class children in the program get to know the lower-class children they react both more positively and, particularly, more negatively to the children on the basis of the individual characteristics of the children, and do not tend, or tend strongly, to generalize their feelings to a whole racial group. For the lower-class children, there is a tendency to move away from greater contact with the middle-class children, particularly the white children, and to choose friends from among their own group, but there is no negative attitude toward the middle-class children as individuals. However, the children tend increasingly toward an attitude of negative evaluation of their own racial group.

We do not know the correlates of these attitude shifts in the lower- and middle-class children. While it is clear that friendship choices are related to cooperative and affiliative play with the children chosen, we do not find that negative evaluation of the Negro children or of the lower-class Negro children is associated with any of our observational categories. Previous research (Moore, 1967) has shown that negative sociometric evaluation of preschool children by their peers is associated with aggressive behavior, failure to cooperate in classroom routines, and emotional dependence upon adults. In those relatively few instances where the children were able to give us elaborated reasons for their negative sociometric choices, the reasons given generally fell into these three categories. For example, children who were disliked were said to "hit" other children, or to be "bad," or to be "a baby." However, we do not know to what degree any or all of these behaviors were characteristic of the disliked children.

A final note of caution is necessary to the interpretation of our study of social interaction. While there are both racial and social-class correlates of liking and disliking other children in the program, we do not typically see nor do our results suggest that children of either racial or social-class group isolate themselves into cohesive, exclusive groups even though occasional instances of this sort of behavior do occur. A large proportion of the social interaction in the Ancona classrooms, and of the friendship choices of the children in the program, occurs across racial and social-class lines.

Linguistic skills

Hypothesis 3 states that disadvantaged children will improve in linguistic skills, in part as a result of contact with middle-class children. Only partial evidence is available to assess this hypothesis and most has been discussed previously.

On teacher and tester ratings of Verbalization (understandability of speech), the lower-class group as a whole shows an improvement which is significant at $p < .05$ on the testers' ratings, but essentially no change on teachers' ratings. The test ratings move from a mean of 6.2 at Time 1 to a mean of 5.0 at Time 2. The teachers' ratings are 5.0 at Time 1 and change to 4.9 at Time 2. Thus, by Time 2 both sets of raters agree on the level of the scale placement for the group. This level is defined as: "speech adequate; there are errors, but speech is still easily understood."

When the lower-class group is split by year of attendance, the first-year children show a non-significant gain on the test rating (6.6 to 6.1) and a slight decrease on the teacher rating (4.9 to 5.2). The older children show a significant improvement on tester ratings (5.7 to 3.5) and a non-significant improvement on the teacher ratings (5.0 to 4.5). The comparable middle-class groups show little, if any change from Time 1 to Time 2, although as we have discussed previously the level is superior to the lower-class children.

On the basis of the rating data we can conclude that there is some evidence to support the hypothesis that the lower-class children improve in linguistic skill over the course of the year. Some of the Birch measures can also be examined from this perspective. As indicated in Table 7, the tendency to work in response to verbal items remains essentially unchanged for the lower-class and middle-class groups and is at a high level initially. As we indicated in our earlier discussion, there are very few significant changes on the Birch measures for the Ancona sample. Looking at trends, there is some possibility of a decrease in tendency to express reasons for not-working verbally on the part of the lower-class children, whereas the middle-class children significantly change in the direction of expressing more not-work responses verbally at Time 2. In general, then, the Birch measures do not support or refute the hypothesis in question.

The last way in which we attempted to get at linguistic change was by an examination of the item by item responses to the Binet test. There are a number of difficulties involved in such an analysis as the Binet is an age scale and is not constructed to easily yield subscores. The content of the items changes from level to level becoming more verbal as one progresses through the scale, but even at the lower levels the items are not balanced as to verbal and performance components.

We did find that the first-year lower-class children very consistently had the most difficulty with items which can be classified as verbal in nature at Time 1. This pattern was also found for the middle-class children in their first year, but it is slightly less consistent. Table 11 shows the most difficult items for these children and percentage passing at Times 1 and 2. The pattern of difficulty found for our sample is not merely a reproduction of the national norms, although there is some difficulty in comparing our data with norms due to the particular way in which the norms are presented (difficulty levels are only available for children at a given M.A. and the items at that M.A. level).

At Time 2, there was definite improvement on most of the items which the children had most difficulty with at Time 1. In general, however, the items which were most difficult at Time 1 were still most difficult at Time 2 for the lower-class group. This was also true for the middle-class group, but there was slightly less consistency.

The only thing we believe it appropriate to conclude from this analysis is that the Binet items which are verbal in character are more difficult for the children in the Headstart group. This is most striking in that the only items below their M.A. level on which they have difficulty are verbal items. At Test 2 there is improvement but the verbal items still remain the most challenging. To

Table 11

Percentage Passing Stanford-Binet Items Which Were Most Difficult for the First-Year Children by Social Class and Test Time*

Item Level and Name	Percentage Passing Time 1	Percentage Passing Time 2
Lower-Class First Year		
II -6-Picture Vocabulary	65	100
II -6-Naming Objects	71	88
III -Picture Memory	41	76
III -Picture Vocabulary	53	82
III-6-Comprehension I	12	53
III-6-Response to Pictures	41	76
IV -Picture Vocabulary	6	24
IV -Comprehension II	12	29
IV -Opposite Analogies	17	23
IV -6-Materials	0	6
IV -6-Opposite Analogies	6	12
IV -6-Picture Similarities and Differences	18	47
Middle-Class First Year		
III -Copying a Circle	75	100
III-6-Patience: Pictures	63	87
IV -Picture Vocabulary	25	47
IV -Naming Objects from Memory	60	80
IV -Comprehension II	60	80
IV -6-Materials	47	60
IV -6-Picture Similarities and Differences	50	93
IV -6-Opposite Analogies	53	67
V -Copying a Square	19	33
V -Patience: Rectangles	31	40
V -Paper Folding	31	60

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*The items shown were selected on the basis of the rank order of difficulty within each age level of the test. Items not shown were always considerably easier for the group.

some extent, this is also the case for the first-year middle-class children.

The data on hand suggest that there is some verbal deficit on the part of the Headstart children in contrast to the middle-class children. Their speech is adequate, but not free of errors, and they experience relative difficulty on items calling for verbal labelling, comprehension and verbal reasoning on the Binet. There is evidence of improvement in verbal skills over the course of the year, particularly in terms of comprehensibility of speech. Whether these children will have continuing difficulty with test items of a verbal character remains an open question. Tests more suited to such an assessment would seem appropriate for further investigation of this question.

PART II

THE STUDY OF ELEMENTARY SCHOOL CHILDREN AND FAMILIES WITH CONTINUED ENROLLMENT

In this part of our study we were concerned primarily with the effects of continuity of educational intervention upon educational achievement. We hypothesized that longer tenure in the program would be of greater benefit for the children's intellectual achievement. Thus we were interested in the current school achievement of public school children with different lengths of tenure in the Ancona nursery school program and in the achievement of children continuing in the Ancona setting during the early elementary years. We were, in addition, interested in the possibility of diffusion effects within families due to continual enrollment of children from the same families in the Ancona program.

Hypotheses To Be Tested

Hypothesis 1: A Montessori program will increase the basic cognitive and behavioral skills of disadvantaged children required for educational achievement. This effect will be greatest if started early (age three) and continued over an extensive period of time.

Hypothesis 1a: The disadvantaged children will show increased cognitive development.

Hypothesis 1b: The disadvantaged children will show increased attentiveness to task demands.

Hypothesis 1c: Disadvantaged children who continue in the Montessori elementary program will show higher school achievement than those who go to public school.

Hypothesis 4: Continuing involvement of the same families in the program will result in "diffusion effects" to the intellectual attainments of older and younger siblings.

Hypothesis 4a: Older siblings will continue to show school attainment above the norm.

Hypothesis 4b: Younger siblings entering the program will show higher initial cognitive and behavioral skills.

Sample

Our study of the effect of tenure in the program on the individual child was based upon test results for three groups of children:

(1) Six disadvantaged children enrolled in the Ancona school: four of these children were at the first- or second-grade level, and were enrolled either in an elementary level classroom (age six to nine, full-day students) or in a transitional classroom (age five to seven, both full-day and half-day students). One child was at the kindergarten level, and was enrolled in the transitional classroom. One child began the year in an elementary classroom but was returned to a nursery school classroom (age three to six) for most of the remainder of the year.

(2) Six disadvantaged children who entered the Ancona nursery school program in September, 1965, and remained for one or two years. These six children are now in grades one and two in public schools.

(3) Sixteen disadvantaged children who were enrolled in the Ancona Headstart program for eight weeks during the summer of 1965, and are now in grade three in public schools.

Our study of "diffusion effects" within families from which successive siblings have been enrolled in the Ancona program was based upon test results for three groups of children:

(1) Of the sixteen disadvantaged children enrolled in summer, 1965, and now in grade three in public school we have third-grade test data for fifteen children, including five children who are older siblings of children currently enrolled at Ancona and ten children who are not siblings.

(2) Of the seventeen disadvantaged children who entered the Ancona nursery school program in the fall of 1968, seven are younger siblings of children who entered the program at an earlier time (from September, 1965, on). The other ten children have not had siblings enrolled at Ancona. We have test scores upon entrance for these two groups of children and for the older sibling group.

(3) In addition to, and overlapping with, our entrance test data for this year's group of younger siblings and their older siblings, we also have entrance test data for a total of fifteen younger siblings who have entered the Ancona program since the fall of 1965 and their eleven older siblings who entered during or after the summer, 1965, Headstart program.

Instruments

For the children enrolled in the Ancona elementary and transitional classes, we have Stanford-Binet test scores obtained at the end of the present and previous years, teachers' ratings of behavior at the beginning and end of the present year, and Metropolitan Reading Readiness Test and Achievement Test scores at the end of the present and previous years.

For the younger sibling, older sibling, and non-sibling groups enrolled in the Ancona nursery school, we have Stanford-Binet test scores and ratings of test

(3) Sixteen disadvantaged children who were enrolled in the Ancona Headstart program for eight weeks during the summer of 1965, and are now in grade three in public schools.

Our study of "diffusion effects" within families from which successive siblings have been enrolled in the Ancona program was based upon test results for three groups of children:

(1) Of the sixteen disadvantaged children enrolled in summer, 1965, and now in grade three in public school we have third-grade test data for fifteen children, including five children who are older siblings of children currently enrolled at Ancona and ten children who are not siblings.

(2) Of the seventeen disadvantaged children who entered the Ancona nursery school program in the fall of 1968, seven are younger siblings of children who entered the program at an earlier time (from September, 1965, on). The other ten children have not had siblings enrolled at Ancona. We have test scores upon entrance for these two groups of children and for the older sibling group.

(3) In addition to, and overlapping with, our entrance test data for this year's group of younger siblings and their older siblings, we also have entrance test data for a total of fifteen younger siblings who have entered the Ancona program since the fall of 1965 and their eleven older siblings who entered during or after the summer, 1965, Headstart program.

Instruments

For the children enrolled in the Ancona elementary and transitional classes, we have Stanford-Binet test scores obtained at the end of the present and previous years, teachers' ratings of behavior at the beginning and end of the present year, and Metropolitan Reading Readiness Test and Achievement Test scores at the end of the present and previous years.

For the younger sibling, older sibling, and non-sibling groups enrolled in the Ancona nursery school, we have Stanford-Binet test scores and ratings of test behavior at the time each child entered the Ancona program.

For the children now enrolled in public schools, we have Metropolitan Reading Readiness Test and Achievement Test scores and Kuhlman-Anderson I.Q. scores, which were obtained from the public school records. For a subgroup of this sample, Stanford-Binet tests were administered in the first grade by Ancona research personnel.

Operationalization of the Hypotheses

Hypothesis 1a: The disadvantaged children will show increased cognitive development.

This hypothesis will be tested for the Ancona children in grades one and two by a comparison of Stanford-Binet I.Q. at the end of the 1968-69 school year with I.Q. at the end of the previous year.

Hypothesis 1b: The disadvantaged children will show increased attentiveness to task demands.

This hypothesis will be tested for the children in grades one and two who are enrolled in the Ancona elementary and transitional classes by examination of teachers' ratings of attention, task behavior and attitudes toward classroom authority which were made at the beginning and end of the 1968-69 school year.

Hypothesis 1c: Disadvantaged children who continue in the Montessori elementary program will show higher school achievement than those who go to public school.

Small numbers of children and lack of achievement test results at grade placement levels which are comparable for all children make it impossible for us to test this hypothesis optimally. However, we do have Metropolitan Reading Readiness Test or Achievement Test results for each child at elementary school level at Ancona and for the children enrolled in public schools, and these will be examined in the light of this hypothesis.

Hypothesis 4a: Older siblings will continue to show school attainment above the norm.

This hypothesis will be tested in the group of public school children now in third grade by examination of the results of Kuhlman-Anderson I.Q. tests and Metropolitan Achievement Tests administered at the third-grade level by the public schools. Achievement of the group of five children who are older siblings of children now enrolled at Ancona will be compared with national norms and with achievement of ten Ancona graduates in the same schools who are not siblings.

Hypothesis 4b: Younger siblings entering the program will show higher initial cognitive and behavioral skills.

This hypothesis will be tested for the group of children entering Ancona in the fall of 1968 by a comparison of Stanford-Binet scores and ratings during testing of attention, task behavior, and attitudes toward the tester, which were obtained when the children started school, for three groups of children: those entering the program for the first time who are younger siblings of children enrolled since September, 1965; those entering the program who are not younger siblings; and the group of older siblings.

We will also address this hypothesis by a comparison of Stanford-Binet scores at the time of entrance into the program for a combined group of all children who were younger siblings of children enrolled since the summer Headstart program in 1965 with the Stanford-Binet scores of their older siblings.

Results

Cognitive and behavioral change and school achievement in the Ancona elementary school children

During the 1968-69 school year only four disadvantaged children were placed at elementary grade levels at Ancona. Thus we cannot apply statistical tests to the hypotheses of change in task-oriented behaviors and cognitive skills for these children, but we will simply look for patterns of change in individual scores and group means on ratings and tests. Table 12 lists teachers' ratings of classroom behavior for each of the four children, at the beginning and end of the school year, and, for comparison, lists the mean ratings given to four middle-class comparison children matched to the four disadvantaged children for age, sex and length of time enrolled at Ancona.

The changes which occurred this year in the lower-class elementary group were all in the direction of greater socialization into school behavior. Task attentiveness (the Distractibility scale) was already at a good level early in the year, and did not change. Increasing self-control was shown by the group in the lowering of Activity Level to a nearly optimal level for the classroom, and in increased control in the expression of emotion. Increased confidence in social and task behavior was shown by the group in change in Self-Confidence on Tasks and Reaction to Failure toward a more realistic attitude, and in decline in Fear of Adult, with movement toward a self-confident attitude. In all of these changes, the lower-class group moved in the direction of the average ratings for the middle-class comparison group. There was some variability in the lower-class group in amount of change: children B and C showed the greatest increase in control and confidence; child D progressed somewhat, but remained at an unsatisfactory level; child A, who was the only second-grader in the group, was already functioning at an optimal level early in the year, and showed almost no change.

Stanford-Binet scores obtained at the end of the 1967-68 school year and at the end of the current year provide a measure of general cognitive growth for the group of four lower-class elementary children. Table 13 shows their scores at these two times.

There was no acceleration of general cognitive growth for these children during the current year. The mean I.Q. was unchanged overall from the end of the 1967-68 school year to the end of the 1968-69 school year, and I.Q. is even lower at the end of the year for the group and for all individuals when one atypical

Table 12

Teachers' Ratings of Behavior of Ancona Elementary School Children Early and Late in the 1968-69 School year

	Distractibility	Activity Level	Initiative with Materials	Self-Confidence on Tasks	Persistence	Reaction to Failure	Sense of Intellectual Challenge	Fear of Adult	Social Initiative with Adult	Communication of Affect	Compliance with Adult	Verbalization
Disadvantaged Group December, 1968												
Child A	1	3	3	5	4	3	3	3	3	3	5	1
Child B	3	3	5	7	5	4	3	7	6	3	4	2
Child C	7	2	7	7	7	5	7	3	5	2	5	3
Child D	8	2	8	9	9	7	6	5	5	1	5	5
Means	4.75	2.50	5.75	7.00	6.25	4.75	4.75	4.50	4.75	2.25	4.75	2.75
Disadvantaged Group May, 1969												
Child A	3	3	5	5	5	3	3	3	5	3	5	1
Child B	3	3	5	3	5	3	3	3	5	5	5	3
Child C	5	3	5	3	5	3	3	1	3	3	5	1
Child D	9	6	8	9	9	6	8	5	4	4	4	6
Means	5.00	3.75	5.75	5.00	6.00	3.75	4.25	3.00	4.25	3.75	4.75	2.75
Middle-Class Comparison Group December, 1968, Means	4.25	4.00	5.00	6.00	6.00	2.75	4.75	1.75	2.50	4.25	4.50	1.00
Middle-Class Comparison Group May, 1969, Means	4.25	5.00	6.00	5.00	4.75	2.25	4.25	2.00	3.25	4.00	5.75	1.25

Table 13

Stanford-Binet Scores of Four Disadvantaged Children in the Ancona Elementary Program

	Stanford-Binet Scores May-June, 1968*			Stanford-Binet Scores May-June, 1969		
	C.A. in mos.	M.A. in mos.	I.Q.	C.A. in mos.	M.A. in mos.	I.Q.
Child A	77	72	93	89	80	88
Child B	71	78	111	83	88	106
Child C	84	98	117	88	118	135
Child D	63	70	112	76	79	104
Means	73.8	79.5	108.2	84.0	91.2	108.2

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*Child C was administered the first of the two tests in January, 1969. We have no previous test scores for this child.

child (Child C) is omitted. This child is atypical for our group of disadvantaged children because of his high I.Q. level and a relatively high educational level in his family, despite a very low income.

The achievement level of the disadvantaged children enrolled in the Ancona elementary and transitional classes is best understood not by a comparison with national norms, but by comparison with children comparable in social status to the Ancona group attending public school. This comparison can only be tentative and inferential due to the small number of children who were at the elementary level at Ancona during the 1968-69 year, and due also to a lack of fully comparable test data.

Two of the children enrolled in the Ancona elementary or transitional classes were given the Metropolitan Reading Readiness Test in June, 1969. Their scores and scores for two groups of public school children who attended the Ancona school program for disadvantaged children for periods of from eight weeks to two years are given in Table 14. Both of the Ancona children are comparable in age

Table 14

Metropolitan Reading Readiness Test Scores of Ancona Children and of Public School Children Who Formerly Attended Ancona

	Number	Age in Mos.	Grade Level at Time of Test	Total Score	%ile Rank of Entering First Grade Children
Ancona Children					
Child D		77	1.9	67	75
Child E		76	.9	47	35
Public School Children					
Group which attended Ancona 8 weeks, summer of 1965 (Means)	14	76.07	1.0	57.57	23*
Group which attended Ancona 1 to 2 years (Means)	5	73.40	.9	43.60	29

*Percentile rank for the eight-week group bears a different correspondence to total score because a different form of the Metropolitan Reading Readiness Test was used in the public schools at that time.

level to the two groups of public school children, though one Ancona child is further ahead in grade placement. Both Ancona children score above the mean of the public school groups.

Metropolitan Achievement Tests have been administered to three disadvantaged children at Ancona during the last two years. Table 15 lists the scores for these three children at the end of the first grade year. (Two of the children reached this level at the end of the 1968-69 year and one child at the end of the 1967-68 year.) The average achievement level of these three children is just slightly below grade level.[1] When these scores on first grade tests were

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[1] The pattern of relatively lower scores on the Reading subtest has been found for the entire middle- and lower-class first grade group at Ancona and is clearly a reflection of the pacing of the elementary curriculum. The performance of the Ancona children excels the norms, and the pattern disappears by third grade.

Table 15

Scores of Ancona Children on Grade 1 Metropolitan Achievement Test

		Grade Equivalent Scores			
	Grade Level at Time of Test	Word Knowledge	Word Discrimination	Reading	Arithmetic
Child A	1.7	1.8	2.2	1.4	2.0
Child B	1.9	1.7	1.5	1.4	1.8
Child C	1.9	1.7	1.5	1.6	1.7
Means	1.8	1.7	1.7	1.5	1.8

compared with the scores on third grade Metropolitan Achievement Tests of public school children who attended Ancona for eight weeks during the summer of 1965, we found that the public school group was eighteen months ahead of the Ancona children in school tenure (with a grade placement of 3.6) but only six to ten months ahead in school achievement (with average grade equivalent scores ranging from 2.2 to 2.9 on subtests comparable to those given to the first grade Ancona group).

It is well known that the cumulative deficit phenomenon associated with the achievement of disadvantaged children would suggest a widening gap between the norm and the achievement level of disadvantaged children as they progress through the school grades. The cumulative deficit is clearly operating in the children we are following in grade three. We believe, however, that the children continuing at Ancona will not be as subject to this pattern because they show little or no decrement at grade one. In addition, one of three Ancona elementary children for whom we have test data was a second grader during the 1968-69 school year. On this child's second grade tests when she was at grade level 2.9, her achievement test scores ranged from grade equivalents of 2.0 to 2.8, and her average level of achievement did not differ from that of the third grade public school children.

On every measure of school achievement available to us, then, the five

Ancona children who were tested performed above the average level of a comparable group of public school children. In addition, the four Ancona children who were first or second graders showed improvement over the year in school behavior, manifested in increased self-control and greater self-confidence in performing school tasks and in relating to their teachers. This achievement and these changes in behavior occurred despite a typical decline over the year in the children's I.Q. scores. Since school achievement and adjustment to school routine are two criteria for evaluating school programs which have obvious face value, it is difficult, on the basis of these data for our elementary school children, to justify the use of I.Q. change as an indicator of program success.

Since we do have I.Q. test scores through the first grade for six children of the group of ten which entered in September, 1965, and showed a large I.Q. increase in that school year, it is of interest to note what has happened to that initial gain. Table 16 lists Stanford-Binet scores at five test times for these six children, three of whom have remained at the Ancona school and three of whom left the Ancona program after two years to enter first grade in public school.

Both the public school group and the Ancona group show the same general pattern of I.Q. change: there is a rise in I.Q. of about fifteen points during the first year of nursery school, with a gradual decline during the two years following. No child in either group has maintained his initial I.Q. gain, though two children in each group are still above their initial I.Q. levels at the end of the 1967-68 school year. In the 1968-69 school year, the three children who continued at Ancona showed a further decline of five I.Q. points to an average I.Q. of 89.67. Two of the three children were below their initial I.Q. levels. While it seems clear that the rise in I.Q. during the first nursery school year of this group of children was indicative of a general program effect, it is also clear that the change which occurred in the children, and which remains unspecified, does not operate to maintain the I.Q. increase.

Table 16

Stanford-Binet Test Scores Obtained Over a Period of Three Years for a Group of Six Children Who Entered the Ancona Program in September, 1965

	Sept.-Oct., 1965			January, 1966			May-June, 1966			Feb.-May, 1967			June, 1968		
	C.A.	M.A.	I.Q.	C.A.	M.A.	I.Q.	C.A.	M.A.	I.Q.	C.A.	M.A.	I.Q.	C.A.	M.A.	I.Q.
Children Enrolled at Ancona in 1968-69															
Child A	45	40	89	49	51	104	53	60	113	62	66	106	77	72	93
Child B	40	38	95	43	53	122	48	60	125	59	61	103	71	78	111
Child F	45	40	89	48	48	100	53	47	89	62	57	92	76	62	80
Means			91.00			108.67			109.00			100.33			94.67
Children Who Entered Public School First Grade in 1967-68															
Child 1	46	39	85	50	49	98	54	59	109	65	68	105	79	78	98
Child 2	48	50	104	52	63	121	55	62	109	65	67	103	81	90	111
Child 3	52	43	83				60	57	95	69	62	90	84	71	83
Means			90.67						104.33			99.33			97.33

School readiness of public school children with different lengths of tenure in the Ancona program

In addition to studying the effects of continuing in the Ancona elementary program upon children's school achievement, we also investigated the effect of long tenure in the Ancona nursery school program upon subsequent elementary school readiness tests given in public school. Tables 17 and 18 show mean scores on Stanford-Binet tests at the time of entrance into the Ancona program, as well as scores on first grade tests, for children who participated in an eight-week summer program at Ancona prior to entering public school kindergarten, as compared with children who spent one or two years at Ancona and typically did not enter public school until the first grade.

Table 17

First Grade Test Scores of Children Who Participated in the Ancona Nursery School Program for Eight Weeks and for One to Two Years

	Stanford-Binet Scores at Entrance to Ancona Program		Beginning Grade 1 Kuhlman-Anderson		Beginning Grade 1 Metropolitan Readiness	
	N	Mean I.Q.	N	Mean I.Q.	N	%ile rank of group mean
8 Weeks at Ancona	16	90.2	14	98.8	14	23 %ile
1 to 2 Years at Ancona	6	85.8	6	103.2	5	29 %ile

Table 18

First Grade Test Scores of Children Attending the Same Public School Who Participated in the Ancona Nursery School Program for Eight Weeks and for One to Two Years

	Stanford-Binet at Entrance to Ancona		Grade 1 Stanford-Binet		Beginning Grade 1 Kuhlman-Anderson		Beginning Grade 1 Metropolitan Readiness	
	N	Mean I.Q.	N	Mean I.Q.	N	Mean I.Q.	N	%ile rank of group mean
8 Weeks at Ancona	8	97.5	8	92.6	7	104.1	6	45 %ile
1 to 2 Years at Ancona	4	85.5	4	92.3	4	105.8	4	29 %ile

Table 17 shows the first grade test scores of children who attended the Ancona program for one or two years and of all children in our follow-up sample who attended the eight-week summer program in 1965. Despite a lower initial I.Q., the one- to two-year group showed somewhat higher school readiness at the beginning of first grade. Table 18 shows first grade test scores for children in the eight-week group and in the one- to two-year group who attended a single public school, and to whom we were able to administer Stanford-Binet tests at the end of the first grade year. In this comparison, the one- to two-year group again shows a lower initial I.Q. At the first grade level, the two groups are almost equal in I.Q. on both individual and group tests, but the eight-week group is superior in reading readiness score. The eight-week group had attended kindergarten at the public school where they entered first grade, whereas three of the four one- to two-year children had remained at Ancona during the year prior to first grade. The writer, who observed the children from the eight-week summer program as they entered public school kindergarten, was impressed with the excellence of the kindergarten teacher at this particular school. It may be that the superiority in reading readiness of the eight-week group at this particular school is a program effect of this one teacher's classroom. The eight-week children at this school are not superior to the one- to two-year group on any first grade I.Q. measure. The children in the total eight-week group(who attended two different public schools) are somewhat inferior to the one- to two-year children on all first grade measures. In summary, there is no clear evidence for superiority in first grade school readiness for children with longer tenure in the Ancona program.

Investigation of diffusion effects to the public school achievement of older siblings in continuing families

In the group of third grade public school children enrolled at Ancona during the summer of 1965, there are five who are older siblings of children enrolled during the 1968-69 school year, and ten who are not siblings. Table 19 shows group I.Q. and achievement test scores for these children, for the current

Table 19

Third Grade I.Q. and Achievement Test Mean Scores of Older Siblings and Non-Siblings

				Grade 3 Grade Equivalent Scores Metropolitan Achievement Test						
	N	Binet I.Q. at Entrance to Ancona	Grade 3 Kuhlman-Anderson I.Q.	Word Knowledge	Word Discrim.	Read.	Spell.	Lang.	Arith. Computation	Arith. Probs.
Older Siblings	5	90.0	97.4	2.3	2.5	2.1	3.2	2.9	3.4	2.6
Non-Siblings Same Public School	4	99.8	95.2	2.1	2.4	2.3	3.2	1.7	2.5	2.6
All Non-Siblings	10	91.7	92.6	2.1	2.3	2.3	2.3	2.0	2.6	2.4

school year.

In all cases where there was a difference between the sibling and non-sibling groups, the difference favored the sibling group. Some of the differences are fairly substantial (about one year in grade equivalent scores on the achievement test), though they do not meet the usual criteria for statistical significance. Despite a lower Binet I.Q. at the beginning of the summer in 1965, the older siblings now show a higher Kuhlman-Anderson I.Q. than non-siblings, and higher achievement in the skill areas of language (a test of punctuation and grammar) and arithmetic computation. It is of interest to note that the older siblings are ahead in skill areas in which drill may be helpful to learning, suggesting greater motivation for school success in these children or their families.

The fact that we are investigating a group of children who have had younger siblings available for enrollment in the Ancona program as compared with a group which has not enrolled younger siblings raises the question of whether differences in school achievement which we have found are due only to differences in birth order between the two groups. In fact, we have found that the older sibling group has a lower average birth order (2.6, range 1-4) than the non-sibling group enrolled at the same public school (average birth order 3.2, range 2-4). However, when we divide each group into subgroups according to birth order, birth order does not account for the differences in achievement which were found.

Our older sibling group and our group of non-siblings enrolled in the same public school overlap substantially with the groups of siblings and non-siblings investigated by Kohlberg (1966) when they were in the first grade. At that time, the sibling group was above average on national norms in school readiness tests. At the time of the current testing, these children were at grade level 3.6. On the average, then, the siblings of continuing families are no longer achieving above average level, and are in fact substantially below grade level in achievement.

In summary, the data available to us suggest that older siblings of continuing families are currently performing below the grade level in which they are placed. However, in contrast to non-siblings who shared the Ancona experience with them, they are performing more adequately than the non-siblings are in skill areas such as arithmetic computation, language (grammar and punctuation) and spelling.

Investigation of diffusion effects to the cognitive and behavioral skills of younger siblings

In the fall of 1968, seven of the seventeen children who entered the Ancona program for the first time were younger siblings of children who had been enrolled at some time since September, 1965. Ten of the children had no older siblings in the program at any time. Table 20 shows the scores on the Stanford-Binet administered shortly after entrance into the Ancona program for the seven younger siblings, their six older siblings and the ten non-siblings. Contrary to our hypothesis of a diffusion effect to the intellectual attainments of younger siblings, the younger sibling group has a somewhat lower I.Q. than their older siblings, although this difference is not statistically significant. Since the younger sibling group included a set of twins, for whom intellectual retardation

Table 20

Binet Scores at Entrance into the Ancona Program for Younger Siblings and Non-Siblings Entering in September, 1968, and for Older Siblings Entering Since September, 1965

	N	C.A.	M.A.	I.Q.
Younger Siblings	7	38.6	34.1	86.9
Non-Siblings	10	49.1	40.8	82.7
Older Siblings	6	48.7	44.0	89.7

may be expected, we also computed the mean I.Q. for younger and older sibling groups excluding the twins and their older sibling. This computation yielded an average I.Q. of 89.8 for the younger sibling group and an I.Q. of 88.6 for the older sibling group. In both of these comparisons, the younger siblings are not noticeably different from their older siblings.

Cumulative data on fifteen younger siblings who have entered the program since September, 1965, and their eleven older siblings are consistent with the results for the 1968-69 school year: the average I.Q. of the younger siblings upon entrance into the program was 88.5; the average I.Q. of their older siblings was 90.5. Thus we have no evidence for a diffusion effect of continual enrollment of families to the intellectual attainments of younger siblings.

Comparison of the means for both younger and older sibling groups, as seen in Table 20, with the mean I.Q. of the entering non-sibling group shows a higher average I.Q. for each of the sibling groups. Although this difference is not statistically significant, it is large enough to suggest that in this program the factors which lead to certain families' continuing in the program also determine that those families will have an I.Q. level somewhat higher than average for children entering the program. It is also the case that for children entering in the 1968-69 year, the range in I.Q. of the younger siblings (76-99) is smaller than the range for non-siblings (57-107). Test results for seven younger siblings and three non-siblings who entered the program in the fall of 1965 are consistent with this year's data. The younger siblings had a higher average I.Q. (89.0) than the non-siblings (82.7). The range of the two groups (78-104 for the sibling group, 70-95 for the non-sibling group) did not differ, despite the fact that the sibling group was twice as large as the non-sibling group. The history of families associated with the Ancona program suggests that those families which leave the program are those which move their residence from the immediate area of the school. These families have frequently been either socially disorganized or upwardly mobile. The families which remain are typically more stable and often more involved in community affairs.

In order to study possible diffusion effects to the behavioral skills of younger siblings entering the program, we compared ratings of attention, task behavior, and attitudes toward the tester during the Stanford-Binet test for younger siblings entering the program in 1968-69, non-siblings entering at that time and the older siblings at the time when they first entered the program. Means of ratings for these three groups are shown in Table 21. As in the case of the Stanford-Binet I.Q., we found greater differences between younger siblings and non-siblings than between younger and older siblings. The only differences which were even marginally significant by statistical test ($p < .10$) showed the younger siblings to be less active, slower in response, and more inhibited in expression of affect than the non-sibling group. We did not compare the older siblings and the current group of non-siblings by statistical test, but it is evident that the mean values on these scales for the older siblings are very close to those of their younger siblings. Again, the group of continuing families seems to be different from the average entrant into the program, the children appearing more timid and more passive during a test.

We feel it proper to conclude that no diffusion effect is evident in regard to the intellectual or behavioral skills of younger siblings from families with

Table 21

Ratings of Behavior During Stanford-Binet Testings for Younger Siblings Entering in 1968-69, Older Siblings at First Entrance, and Non-Siblings Entering in 1968-69

	Number	Distractibility	Activity Level	Speed of Response-Verbal Items	Speed of Response-Performance Items	Initiative with Materials	Self-Confidence on Tasks	Persistence	Reaction to Failure	Sense of Intellectual Challenge	Willingness to Continue	Fear of Adult	Social Initiative with Adult	Communication of Affect	Compliance with Adult	Verbalization
Younger Siblings	7	4.7	5.4	5.4	5.0	5.7	6.0	6.0	1.4	5.9	4.5	5.7	6.6	5.7	4.1	6.6
Older Siblings	6	6.0	6.0	5.0	4.3	5.8	5.4	6.3	1.7	6.3	5.8	5.8	6.0	6.0	5.2	6.2
Non-Siblings	10	5.2	3.8*	4.4	3.4*	5.3	5.2	5.4	1.3	5.4	5.3	4.4	4.4	3.7*	4.7	6.6

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*Difference from mean score of younger siblings significant at $p < .10$.

continuous involvement at Ancona. Evidently, however, the families who have remained in the neighborhood and have continued to participate at Ancona are somewhat different from other families who have sent children to the Ancona program. The children of the continuing families seem somewhat more inhibited than children from non-continuing families and they tend to have a higher mean I.Q.

SUMMARY

The effect of a Montessori preschool and elementary school experience on the intellectual functioning, school-related behaviors, and social interactions and perceptions of disadvantaged children has been investigated. The sample studied this year consisted of thirty-five disadvantaged children; thirty-one were attending nursery classes at Ancona and four were in elementary classrooms. Each child was pair-matched with a middle-class comparison child on the basis of sex, age and previous attendance history. In the disadvantaged group, seventeen children were new to the school this year. Of these seventeen, seven were younger siblings of children who had attended Ancona previously or were currently attending the school.

All disadvantaged children and the middle-class comparison sample were tested near the beginning of the academic year and near the end of the year with the Stanford-Binet, Piaget tasks of length conservation (and transitivity where appropriate), and a sociometric interview. Teachers rated the children at the beginning and end of the year on a number of scales having to do with task orientation and social relationships with adults. Testers rated the children on parallel scales relating to the performance of the child in the Stanford-Binet testing session. In addition, the children's responses to the Binet were coded using a modification of a procedure developed by Hertzig, Birch, et al. (1968) which also assesses task orientation. In the middle of the year, observations of the social interaction of the children were collected by observing child behavior during free time in the nursery school classes. Elementary school children were tested with the Stanford-Binet and achievement tests at the end of the year and rated by their teachers at the beginning and end of the school year.

In addition to data collected by our staff, follow-up data on Ancona graduates who were participants in previous Headstart programs at the school were obtained by locating children in the public schools of the city and obtaining test data available in the schools.

The first hypothesis investigated was in regard to the cognitive development of the Headstart children. It was postulated that intelligence test performance would increase and that the effect would be greatest if started early and continued over a number of years. It was also postulated that children continuing in the Ancona elementary classes would show higher school achievement than children who went to public school after Ancona preschool.

In regard to intelligence test performance, the following main points may be made. Children who participated in the Ancona program for the second year this year did not show an increase in I.Q. during this year or last year. This group of eleven children started with an average I.Q. of 96 which has remained essentially stable. Children who had participated in the Headstart program during 1965 and had shown an I.Q. increase in general returned to their initial level of intelligence test performance after leaving Ancona. Children who entered Ancona for the first time this year showed an increase in I.Q. from a mean of 84 to a mean of 92, but this increase was not statistically significant. On the basis of available data, it seems that I.Q. change is most likely to occur if children start with an initial level considerably below 100. The permanence of such change, however, is highly unlikely.

In contrast to the data for intelligence test performance, there is limited support for the hypothesis that continuing in the Ancona elementary classes will lead to better school achievement than transferring to public school. Although the number of cases is extremely small to date, the performance of the Ancona first graders is definitely superior to the performance of children who have gone on to public school. This is the case in spite of the fact that the elementary children also show the intelligence test decline characteristic of the other groups we have mentioned.

Piaget tasks were administered to verify the trend present in past data suggesting that the preschool experience would not have an effect on conservation. This trend was completely verified. Consequently, Piaget tasks will no longer be administered as part of the research program at the school.

An examination of behavioral skills was made to see if the Headstart children would improve in regard to task orientation and other attributes thought to be predictive of school success. Some differences were found between the Headstart children and the middle-class comparison group, particularly in regard to understandability of speech. However, the most striking finding was the high degree of similarity between Headstart children and middle-class children in regard to task orientation. The pattern of similarity was present on all probes we used. Test ratings, teacher ratings, and the modified Birch procedure all showed the same picture. Since the children were highly similar at the beginning of the year, little change could be expected and little was found. Where changes did occur, they were almost all in the direction of improved adaptation to the requirements of schooling. In general, a high level of adjustment and task orientation was found for both the preschool sample and the children in the elementary program. The elementary children showed some change in the direction of greater confidence in performing tasks and in self-control.

In the realm of social behavior we examined the hypothesis that we would see more friendship choices, facilitated by common interest and activities, forming across social-class lines. The hypothesis was confirmed for middle-class children only. Our middle-class comparison group showed more cross-class friendship choices on a sociometric test and more cross-class cooperative play in the classroom with longer tenure in the program. In general, the middle-class group did not deviate as much in play or in friendship choices from the actual proportions of social-class and racial groups in the classroom as did the lower-class children. Lower-class children who were new to the program showed much cooperative and affiliative play with middle-class children, but this was primarily with middle-class Negro children. Their cross-social-class play was not reflected, however, in friendship choices on a sociometric test. Lower-class children with longer tenure in the program showed a strong tendency to within-class play and friendship choices.

We found in our sample an increasing tendency to a proportionately greater negative evaluation of Negro children than of white children. For the middle-class group, dislike was expressed of specific Negro children in their own classroom, with older middle-class children more particularly showing proportionately greater dislike of lower-class Negro children. However, this tendency did not generalize to negative attitudes toward unknown Negro children. In contrast, the lower-class children showed no greater tendency to dislike Negro children in their own classroom, but increased on negative attitudes toward unknown Negro children.

We were also interested in the effect of the program on linguistic skills. We had limited evidence here, but the Headstart children did show improvement in terms of the understandability of their speech. On the Binet test, the items with which they had most difficulty were verbal in character. Improvement occurred on these items from first to second testing, but they were still the most difficult items for the children. On the basis of the evidence available to us, we feel that a verbal deficit is probably present in the children, but more pointed assessment procedures would be necessary to verify this.

A certain number of families have had children participating in the Ancona program over a number of years. In addition, the mothers in these families have had long-term contact with the school and the school staff. We were interested in possible diffusion effects which might be operative in these families. One possible effect was that older children who had once participated at Ancona, but who were now in public school, would be achieving above the norm as had been the case at grade one. Another effect was that younger siblings would enter the program with higher initial intelligence test performance and higher ratings on behavioral skills.

In regard to younger siblings, we could find no difference in their status at entrance when comparing them with their older siblings. There is some indication, however, that the families with children who have continued to attend Ancona differ somewhat from other families. The data suggest that the continuing children are somewhat more inhibited as a group and have a slightly higher mean I.Q. than children coming from non-continuing families. It may be that the continuing families are more stable than the non-continuers in that they have remained in the neighborhood over a period of years. This suggests that the continuing families are neither the most upwardly-mobile nor the most disorganized of families who have been served by the Ancona program.

The number of cases available for study at the elementary level and in regard to diffusion effects is quite small and all conclusions must be considered quite tentative. We plan to continue the follow-up aspects of the study during the 1969-70 academic year, when trends may become more apparent and our confidence in them bolstered by more cases.

In regard to the preschool experience, it seems appropriate at this juncture to attempt to become more specific in terms of curricular effects. Measures which are more directly relevant to the Montessori curriculum may show cognitive change in certain areas whereas the general character of the Binet does not permit such assessments. Our future plans include testing with certain scales of the WPPSI and Merrill-Palmer Scales in an attempt to assess such characteristics as change in certain psychomotor skills, number concepts, and other attributes to which the curriculum is oriented.

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APPENDIX A

Ancona School Headstart Program Ratings of Behavior During Individual Intelligence Testing

Name ______________ Date __________ Stanford-Binet Form ______ Examiner ______________

Distractibility

1	2	3	4	5	6	7	8	9
Completely absorbed by task. Maintains interest throughout, remains oriented to E between items		Interested & attentive, with little attention to things external to the test		Normal attentiveness. Tasks elicit sufficient attention, though attention may occasionally wander between items		Attracted by things external to the test, but can return to task. If child tries to maintain attention, it is with some effort		Difficult to get and hold attention

Activity Level

1	2	3	4	5	6	7	8	9
Hyperactive; activity out-of-bounds		Quite active, but with control of own activity		Fairly active, but able to sit quietly for the testing		Rather sedentary, slow; or somewhat constricted in action (Circle which)		Depressed or very constricted (Circle which)

Speed of Response - Verbal Items

1	2	3	4	5	6	7	8	9
Responds very rapidly to instructions		No hesitation in responding		Some deliberation, but responses not generally slow		Usually slow to respond		Slow to respond; urging needed

Speed of Response - Performance Items

1	2	3	4	5	6	7	8	9
Responds very rapidly to instructions		No hesitation in responding		Some deliberation, but responses not generally slow		Usually slow to respond		Slow to respond; urging needed

Initiative in Dealing with Test Materials

1	2	3	4	5	6	7	8	9
Impulsively handles materials, begins own tasks		May begin to handle materials, may feel he knows what to do		Waits for instructions, but eager to begin		Responds to instructions, but does not initiate activity; is not "set" to begin until instructions given		Urging needed to respond

Self-Confidence on Tasks

1	2	3	4	5	6	7	8	9
Over-confident; does not recognize own limitations		Quite confident in own ability. Answers assertively		Realistically self-confident. May show recognition of own limitations; responds matter-of-factly		Some distrust of own ability, hesitancy		Distrusts own ability. Hesitant in response; may express concern about adequacy of responses

Persistence

1	2	3	4	5	6	7	8	9
Can't give up, even after much effort		Very persistent; difficult tasks lead to redoubled effort		Some persistence; doesn't give up without trying		Tendency to give up after first attempt unsuccessful		Gives up easily, when answer does not come almost immediately

Reaction to Failure

0	1	2	3	4	5	6	7
Ignores failure; success or failure not an issue	Aware of failure, but shows no discomfort, and does not need reassurance		Some discomfort at failure can be seen, but confidence easily restored		Disconcerted by failure, needs frequent reassurance		Withdrawing, hostile or denying (Circle which)

Sense of Intellectual Challenge

1	2	3	4	5	6	7	8	9
Hard tasks elicit greater interest and a sense of challenge		Hard tasks are met with special effort		Effort expended on problem is appropriate to level of difficulty, but there is no sense of challenge		Apparently more comfortable with easy tasks		Prefers only easy tasks

Willingness to Continue with Test

1	2	3	4	5	6	7	8	9
Eager to continue		Maintains active interest		Mild interest in tasks; continues to try		Loses interest in tasks, but continues to comply		Actively seeks termination

Fear of Adult

1	2	3	4	5	6	7	8	9
No shyness; quite self-assured		Rather confident		Neither confident nor fearful		Rather timid		Painfully shy, constricted

Social Initiative with Adult

1	2	3	4	5	6	7	8	9
Attempts to dominate the situation		Often initiates social interchange		Responsive, but usually does not initiate social interchange		Rather passive		Never takes initiative; responses minimal

Communication of Affect

1	2	3	4	5	6	7	8	9
Almost no inhibition of affective expression		Expresses affect freely, but with self-control		Occasional expression of affect		Tends to inhibit affect, or rather flat (Circle which)		Very flat; no emotional expression

Compliance with Adult

1	2	3	4	5	6	7	8	9
Extremely sensitive to adult's wishes; constantly looks to adult for permission to act		Tends to ignore own needs; rather anxious to comply		Makes own needs known, but quite willing to comply		Somewhat unwilling to comply		Actively negativistic

Verbalization

1	2	3	4	5	6	7	8	9
Speech perfectly clear and understandable		Occasional errors within generally good speech		Speech adequate; there are errors, but speech is still easily understood		Speech sometimes difficult to understand. This may be true especially when speaking rapidly		Speech very difficult to understand

Descriptive comments (a sentence or two, with examples if possible):

Articulation:

Structure:

Vocabulary:

APPENDIX B

Percentage Distribution of Performance on the Conservation Items for the Ancona Sample by Social Class, Length of Attendance and Time

	Lower-Class Total		Middle-Class Total		Lower-Class First Year		Middle-Class First Year		Lower-Class 2 to 4 Years		Middle-Class 2 to 4 Years	
Scale Points	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2
1	871	867	839	862	765	824	750	800	1000	923	933	929
2	645	700	774	690	471	529	625	733	857	923	933	643
3	323	400	645	621	294	235	562	467	357	615	733	786
4	290	233	323	414	235	176	187	333	357	308	467	500
5	419	433	613	556	353	471	687	467	500	385	533	667
6	207	103	300	250	133	-	250	133	286	231	357	385
7	161	100	290	357	059	-	187	333	286	231	400	385
8*	032	0	065	276	-	-	-	-	071	-	133	571

1 - Discriminates the longer of two sticks
2 - Remembers which stick was longer when asked
3 - Expects constancy of length
4 - Conserves length when sticks are disaligned
5 - Conserves length when one stick is bent (deformation)
6 - Believes quantity of given does not change in disalignment or deformation of stick
7 - Conserves with certainty in both disalignment and deformation
8 - Verbalizes the principle

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*Verbalization of the principle of conservation is not computed as a scale point but is included for information here.

APPENDIX C

Report of the Social Work Aspect of the Ancona Headstart Program

The general purpose of the social worker's activities was to enhance the meaning and value of the Headstart program for the children and their families, primarily through work with and on behalf of the parents.

There were two major thrusts to the social work program. The first was to help parents participate in school activities, both as Ancona parents and as Headstart parents. The second was to help the families deal with extra-school problems and pressures which were directly and indirectly having a negative impact on the value of the Headstart program for their children and themselves.

With regard to parent participation, the worker did such things as visit all new families at the start of the year to introduce them in a personal way to the school, to answer their questions and to offer to help with other problems; contact parents before school open houses and general meetings to encourage their attendance; hold parent group meetings at which school-related matters were discussed; and, most importantly, by the end of the year, involve a small group of parents in taking some responsibility for planning meetings, contacting parents, etc.

Growing out of visits to new families, teacher referrals and parent requests for help, the social worker devoted considerable time to attempting to help families deal with extra-school family and community problems. With regard to family problems, for example, there were frequent contacts with the Department of Public Aid and much time devoted to locating and referring families to community health and welfare agencies. Although several parents initiated requests for counseling services, reality pressures made it almost impossible for them to sustain involvement in attempting to solve problems which were primarily intra- or interpersonal in nature. For example, a woman who had one week expressed concern about her angry, withdrawn twelve-year-old daughter was, by the next week, totally absorbed in her futile efforts to obtain public assistance reimbursement for an approved moving expense which was more than two months overdue.

This kind of situation was typical of those continually encountered by all of the families in their relationships with health, welfare and education resources in the community. Rather than give additional examples, it might be better to note that, despite her own public welfare employment in another urban community, the social worker found the lack of responsiveness to the very real needs of these families both shocking and incredible.

Thus, it soon became clear that, insofar as the families' energies were realistically devoted to their efforts to survive, the school could best serve them and their community by supporting not only their individual, but their organized efforts to improve their housing, public schools and standard of living. The social worker, for example, helped direct the school's fund raising efforts on behalf of the local Welfare Rights Union, of which two Headstart mothers were chairman and vice-chairman, respectively. She also participated in the school's efforts to help parents keep abreast of and deal with the complex plans for urban redevelopment in the neighborhood, which would result in a number of the Headstart families' being displaced; and she encouraged parents to become and remain active in local community organizations.

The parent group meetings were used, in part, as miniature "town meetings," at which parents discussed community concerns and were enlisted as members of groups which existed in the community for the purpose of solving these community problems. This use of meetings was possible because a core group of the Headstart mothers was already active in the community (Welfare Rights, PTA, Operation Breadbasket, Kenwood-Oakland Community Organization) and welcomed the opportunity to reach people with similar concerns who were not active.